FIELD CROP ABSTRACTS

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REVIEW ARTICLE

FODDER PRODUCTION FROM WINTER-SOWN CEREALS AND ITS EFFECT UPON GRAIN YIELD

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INTRODUCTION

Whilst one occasionally hears of winter-sown cereals being cut to provide a crop for drying or silage, the use of cereals for fodder is chiefly for *in situ* grazing. Where experiments in which mechanical defoliation have been used are quoted from the literature, it must be realised that in most cases it was the experimenter's intention to simulate the grazing process.

It should be stated at the outset that there are three sets of circumstances in which a cereal crop may be grazed, namely :

i. it may be sown for grazing only, the crop being ploughed-in after grazing has been completed.

ii. it may be sown with the dual objective of providing both grazing and grain.

iii. it may be sown for grain, but may be grazed as an emergency measure. The emergency may be caused by excessive vegetative growth which is liable to severe lodging or by an unexpected and acute shortage of stock feed at a time when a moderate vegetative growth of cereal is available.

EXTENT OF THE PRACTICE IN WORLD AGRICULTURE

Cereals are sown exclusively for grazing in several parts of the world. In the USA, several States are reported as using cereals, as well as Italian ryegrass, for this purpose. In the southern parts of the Gulf States of Texas and Louisiana cereals do not ripen their grain satisfactorily but are sown for winter fodder, and at the same time provide some protection from soil erosion (Stansel *et al.*, 1937 ; Washko, 1947). Reports of similar usage come from N. Louisiana (Washko, 1947), Kansas (Shaw and Atkesen, 1942), Oklahoma (Staton and Heller, 1949), Tennessee (Washko, 1947), Rhode Island (Odland *et al.*, 1942) and Missouri (Etheridge *et al.*, 1935). The practice is also found in several parts of Australia (Madsen, 1949 ; Cariss, 1945 ; Thomas and Watson, 1949), whilst in New Zealand it is reported (Greenall, 1944) that some 5% of the total cereals sown is for this purpose. In the prairie provinces of Canada, spring cereals are sown for grazing (Kirk *et al.*, 1934) and they are regarded as more reliable than the native grasses. The low winter temperature does not permit autumn-sown cereals to be used in this way. Winter barley and oats sown in the spring, however, have been used in both Canada and the USA (Whyte, 1946) to provide high-quality fodder during the summer for drying.

In most cases, rye is the cereal used. In South Louisiana, Australia and the prairie provinces of Canada, oats are preferred for the purpose. Rye tends to be used on the poorer soils and in the less favourable climates. It is, of course, quite commonly used as a catch crop for winter grazing in Great Britain, notably on the breckland borders of Suffolk, Norfolk and Cambridgeshire and also on the chalk soils of Wiltshire and Hampshire.

The deliberate use of winter-sown wheat as a dual purpose crop is met with very commonly in the mid-western States of the USA. It appears to be mainly associated with the hard, red winter-wheat area including the States of Kansas, Texas, Nebraska, Missouri, and Oklahoma. The practice is also reported from Tennessee, Ohio, Indiana and New Jersey in the soft, red winter-wheat area.

In the State of Kansas it is reported that some 65% of the 12–15 million acres of hard, red wheat are used for fall- and spring-grazing. In this region the rotation is fallow/wheat, or fallow/wheat/grain sorghum. The native grasses plus forage sorghum provide summer grazing for stock, whilst autumn-sown wheat plus sorghum silage, or "bundle feed," are used for winter grazing (Swanson and Anderson, 1951). In parts of Texas, winter-sown cereals, including barley and oats, as well as wheat, are used after Sudan grass has finished growth in the autumn (Stansel *et al.*, 1937). These systems have allowed cheap wintering of beef and sheep to be developed. The practice is less common in the winter-sown soft-wheat areas, presumably because other forms of inexpensive winter feed are available in the form of maize silage and standing forage crops.

Winter oats are grown for grazing and grain production in Western Australia (Thomas and Watson, 1949; Thomas and Millington, 1944) and in the Mallee cereal areas of Victoria (Sims, 1943), and they are a major source of winter grazing for

TABLE 1

Grain response of winter-sown cereals to grazing or clipping (yield expressed as a percentage of the control)

	Control. Yield cwt./ac.	Spring grazing	Fall grazing	Fall and spring grazing	Several* grazings	Remarks
WHEAT						
Nebraska (a)	12·0	−33·8	−15·6	−38·3	—	Grazed. Spring grazing, mean of early and late.
,, (b)	12·0	−32				Grazed 1 plot.
		−34·5				Clipped—mean of 4 dates and 3 heights.
Texas (c)	10·7				+31·9 (3)	Clipped—1 centre over 2 years.
Kansas (d)	15·0	− 4 (early)		+ 9·2 (moderate)		Grazing. After fallow. Mean of 5 years.
,,		−24·8 (late)	+12	−12·4 (severe)		
	14·7	−10·8 (early)		− 4·8 (moderate)		,, After cereal.
		−17·2 (late)	− 3·6	−19·6 (severe)		
,, (e)	16·4	− 7	−10			Grazing.
Oklahoma (f)	14·9				+ 2·7	Clipping to 3 March — Mean of 5 varieties over 3 years
					+ 7·2	,, ,, 15 ,,
					− 2·7	,, ,, 1 April
					−45·7	,, ,, 15 ,,
					−91·5	,, ,, 1 May
Indiana, 1945 (g)	17·8	+26				Clipping. Early — Good soil and season.
		−95				,, Late — Up to 90% lodging.
,,	17·3	−29				Clipping. Early — Poor soil and season.
,, 1946 (g)		−83				,, Late
New Jersey (h)	15·2	−30	+19	−24		Grazing. Mean of 4 years. 60–100% lodging on control plots.
Tennessee (i)	13·8			−28·6		Grazing. Mean of 2 varieties over 3 years.
Ohio (j)	—	−31				Clipping.
South Africa (k)	—	− 5·1			−23·8 (2)	Clipping. Mean of 8 years.
					−59·3 (3)	
New Zealand (l)	24·1	− 6·8				Grazing. Mean of 4 years.
WINTER OATS						
Texas (c)	10·7				−34·1	Clipping. 1 centre over 2 years.
Tennessee (i)	17·3			−33·2		Grazing. Mean of 2 varieties over 3 years.
South Africa (k)	—	−16·2			−30·6 (2)	Clipping. Mean of 8 years.
					−72·3 (3)	
New Jersey (h)	16·8	+ 1	+13	+19		Mean of 4 years. Lodging on non-grazed plots.
Argentina (m)	—	+10·7				Mean of 5 varieties.

All the recorded experiments for winter barley and winter rye show negative responses except in the experiments in Argentina (m). Here barley gave +2% and rye +27% response to grazing. Rye also gave a positive response in the New Jersey experiments.

* Figures in brackets indicate the number of grazings or clippings.

(a) Kiesselbach and Lyness, 1948.
(b) Kiesselbach, 1925.
(c) Stansel *et al.*, 1937.
(d) Swanson and Anderson, 1951.
(e) Norman, 1933.
(f) Hubbard and Harper, 1949.
(g) Cutler *et al.*, 1949.
(h) Sprague, 1954.
(i) Washko, 1947.
(j) Welton and Morris, 1931.
(k) Thomas and Millington, 1944.
(l) Hilgendorf, 1938.
(m) *Bol. Chac. exp. La Previsión*, 1935-9.

dairy cattle in New South Wales (McCymont and Paxton, 1947). In New Zealand (Hilgendorf, 1938) about half of the wheat sown in the Canterbury area is used for grazing as well as for grain production.

Grazing of winter cereals grown under irrigation is practised in some of the low rainfall regions of South Africa. Systems for using the four cereals, with different dates of sowing, have been worked out (Marais, 1935) to provide grazing. As in the USA, grazing is not necessarily confined to a once-over grazing, but as many as three consecutive grazings may be carried out.

Similar practices are also reported from Argentina and Uruguay (Delazoppa and Henry, 1949).

In the British Isles the practice is known in most areas and has been used from time to time. There does not seem to be any locality (NAAS, 1955) where it has become systemised and incorporated into a farming routine such as that described for the hard, red winter-wheat area of the USA mid-west. On the contrary the practice seems to be sporadic and opportunist in character. In the more arable areas of the country, grazing or other methods of defoliation are sometimes used to give a check to a crop which is regarded as too forward in the winter or early spring. Other farm measures have been evolved in these areas to avoid such occurrences, however. These include the avoidance of too early sowing, caution with rates of seeding and autumn use of nitrogenous fertilizer. In Wales, the south-west and the west Midlands the grazing of cereals does seem to be a little more common (NAAS, 1955). In these areas, the cereal is used mainly as an emergency feed for stock, although the statement is sometimes made that grazing a thin crop will help by encouraging tillering.

On the other hand, there have been, and are, enthusiastic individual advocates of the practice. Wibberley, in 1917, devised a system of farming that was partly based upon winter feed produced from very early-sown cereal crops. Amos (1919), in Kent, was a strong advocate of grazing in the case of wheat sown on very rich land such as ploughed-out hop gardens. More recently, Solly (1956) of Kent, has incorporated the practice into his system of intensive mixed arable – horticultural – dairy farming. Croft (1950) surveyed a number of cases where grazing of winter-sown cereals had been carried out. In most cases he found that grazing was not an annual routine but was of an emergency character only. He also found that there was a small number of producers of dried grass who were interested in winter-sown cereals for providing the first crop for the drying season.

In Great Britain, the main interest in cereals for grazing lies in the early spring period. In the southern mid-west States of the USA the interest is in autumn- and winter-, as well as in spring-grazing (Swanson and Anderson, 1951). The rye-grasses, Italian, perennial and H.I., together with late kales are the alternative plants for early spring grazing in the United Kingdom.

The effect of grazing on subsequent grain yield is reviewed in the next section. If grazing could be obtained without loss of yield there would be an obvious place for it in British farming. If grain yields were reduced thereby, it still may be of value, provided that the resulting financial loss was more than compensated for by the value of resultant meat or milk.

The Effect of Grazing on the Crop

Effect on grain yield

There have been a number of experiments in various parts of the USA to test the effects of grazing upon grain yield. These have been carried out, but not exclusively, in the southern mid-west States where the practice is common. It may be noted that such experiments in Kansas date back to 1888 (Shelton, 1888). Experimental work has also been published from Australia, Argentina and South Africa. The results of a number of these overseas experiments have been summarised in Table 1. A basic yield is given in each case and the response to grazing is stated as a percentage of the control.

It will be noted that in the majority of cases grazing has resulted in a reduction in grain yield, sometimes of a very high order. Increases in yield are reported from Kansas, Texas, Oklahoma, Indiana, New Jersey and Argentina. The positive response in Kansas was associated with moderate grazing in the fall and also with moderate fall- plus spring-grazing. In New Jersey, grazing was again in the fall, whilst in Texas and Oklahoma it was moderate, but continued, winter grazing or clipping. In Indiana and Argentina, a positive response was associated with spring grazing.

In each case where a positive response was obtained it was reported that growing conditions were good. For example, in Kansas, a positive response was obtained from wheat following fallow, but a negative response resulted when the wheat followed a cereal crop. Similarly, in Indiana the positive response was obtained in one year when both season and soil were favourable to prolific vegetative growth. The following year on a poorer soil and with a less favourable season, a negative response was obtained. In Texas, the autumn- and winter-grazing seasons were good generally, but there were short periods of very severe frost (in one year the February minimum reached 1°F.) which caused appreciable damage to leafage. The workers attributed the gain in yield partly to the less severe damage on the grazed plots. Table 1 also records certain positive responses in the case of winter oats. In the overseas published work with

barley and rye, negative responses only have been recorded, with the exception of the Argentina and New Jersey trials.

It will be noted that positive or negative responses are not specifically associated with the method of defoliation, i.e. grazing or clipping.

Experimental work in this country is more limited. What is accessible has been summarised in Table 2.

Once again it will be noted that in most cases defoliation, whether by the grazing animal or by a mechanical device, has been accompanied by a reduction in grain yield. There were a few cases of positive responses occurring, however, and these merit further consideration.

The Kesteven trial in 1948 gave positive responses with early-April grazing, although there was no indication of its statistical significance. The response was greater in the absence of, compared with in the presence of, nitrogen top-dressing relative to the equivalent non-grazed plots. In 1949, the Kesteven trial again gave a positive response from early grazing, although this failed to reach the significance level. This trial is of particular interest in that, as in the case of the New Jersey trial, the positive response was associated with control of lodging present on the non-grazed plus nitrogen plots. Positive responses were obtained in the 1953 Somerset and the 1954 Cornish trials, the former with wheat and the latter with winter barley. In neither of these trials was lodging a factor and in neither can the significance of the increase be assessed. Finally, the positive response in the case of winter barley in the Yorkshire trial is of interest. Unfortunately, straw-yield figures only are available because of an almost complete loss of grain due to bird damage on the abnormally early-ripening plots. It is to be noted that the early plots were sown on 27 July and fodder cuts were available by 18 October. Considerable weed growth accompanied these early-sown plots, a fact which probably accounts for the reduced yield compared with those sown on 8 September. Wheat sown and cut at the same time as the winter barley gave negative responses, and oats were a complete failure owing to frit-fly attack.

All the British experiments quoted, with the exception of the last, have been concerned with spring grazing. It should be pointed out that the ecological conditions permitting autumn and winter grazing in the USA are very different from those in Great Britain. In many cases the crop is sown in September and grazing is available by the middle of October. In order to obtain a grazable yield before Christmas, Holliday (1951–6) had to sow at the end of July. At Rothamsted (1932), also, an autumn grazable yield was obtained from July sowings but in this experiment plots were not allowed to remain for grain.

Gough and Dunnett (1950), in investigations in East Anglia, showed that the severe and continuous grazing of winter-sown cereals by rabbits could reduce grain yield by well over 50%. In supplementary experiments where clipping was used, Gough (1955) obtained an 8·9% reduction in grain yield compared with 37% reduction from grazing. In these investigations the severe defoliation over the winter caused suppression of tillering and secondary root formation, and, in many cases, resulted in the death of individual plants.

The influence of grazing intensity on grain yield

The effect of grazing intensity on grain yield is reported by several workers. In most experiments both here and abroad, the later grazing has been continued into the spring the greater has been the reduction in grain yield.* This is shown for the British experiments quite clearly in Table 2. An exception to this general rule occurs in the Texas experiments reported by Stansel *et al.* (1937). Here, continuous clipping up to 1 March gave greater yields than clipping up to 15 February only; but grazing to later dates led to reduction in yields. A somewhat similar result was obtained in Oklahoma by Hubbard and Harper (1949).

Grazing intensity in the sense of several grazings rather than one led to greater reduction in yields in South Africa and New Zealand (see Table 1). Similarly, in Kansas (Swanson and Anderson, 1951), whilst moderate grazing in the fall and in the fall plus spring, led to small positive responses, severe grazing at these times led to negative responses. Severe grazing was defined ' so that the plots had the appearance of being cut with a lawn mower.' Moderate grazing was done less closely—to a degree that ' would be considered to be good farm practice.' Similarly close defoliation produced a greater grain loss than moderate defoliation in the Wye (Peto, 1952) experiments. Table 3 gives the effects of both closeness of cut and date of cut in Kiesselbach's experiments in Nebraska (1925).

TABLE 3

Effect of cutting date and cutting height upon percentage reduction of grain yield

Date of cut	Height of cut		
	5 in.	3 in.	1.5 in.
30 April	5·23	11·5	29·97
5 May	30·66	42·51	61·67
10 May	51·22	62·37	74·56
15 May	71·78	80·14	88·50

*It is clear from the literature that the increasing adverse effect takes place before inflorescence-loss by defoliation occurs.

TABLE 2

Grain response of winter-sown cereals, in British experiments, to grazing or clipping (yield expressed as a percentage of the control)

	Control. Yield cwt./ac.		Grazed to end-March		Grazed to mid-April		Grazed to end-April		Grazed after 1 May		Remarks
	N_0	N_+	N_0	N_+	N_0	N_+	N_0	N_+	N_0	N_+	
ROTHAMSTED (a)	15·7								−14·0*		Grain } Wheat grazed.
	28·4								−15·9*		Straw } 1-year's result.
E. MIDLANDS N.A.A.S. (b)											
Kesteven 1948	26·8	30·9			+ 7·1	+ 0·2	−24·6	−25·2			Grazed by sheep. Wheat, replicated.
,, 1949	26·2	23·6			− 2·1	+ 6·3	−13·4*	+ 2·5			,, ,, ,, ,, ,,
Northants 1949	19·6	22·0			−25·0*	−15·0	−38·3*	−40·9*			,, ,, ,, ,, ,,
,, 1950	31·7	31·9			−11·3	−12·2	−16·1	− 5·0			,, ,, ,, ,, ,,
Mean	26·1	27·1			− 7·9	− 5·1	−21·8	−16·6			,, ,, ,, ,, ,,
W. MIDLANDS N.A.A.S. (b)											
Monmouth	18·5	21·3			−16·2	−14·1	−87·0	−76·9			Grazed by cows. S172 1 block only.
Nantwich 1949	25·0						−22·4				,, ,, ,, S147 1 block.
,, 1950	26·4						−25·7				,, ,, ,, Wheat 2 blocks.
S. WEST N.A.A.S. (c)											
Somerset 1952	17·5	22·2	− 4·5	− 6·7							Grazed by sheep. S172 2 blocks.
,, 1953	13·9	13·1	+10·8	+49·6							,, ,, ,, Wheat 2 blocks.
Cornwall 1954	21·2	27·0			+41·0	+26·7					,, ,, ,, Winter barley 1 block.
Mean	16·8	19·5	+15·5	+16·4							
WYE (d)											
Exp. I 1950	24·1		−17·4*								Moderately grazed, wheat.
			−44·0*						−86·3*		Severely clipped, ,,
Exp. III 1950	44·9	46·7					−23*	−15			1 cwt. S. of A. } Wheat. Some lodging on
		45·8						− 8			2 ,, S. of A. } non-grazed plots.
YORKS											
Exp. I (e)	26·3		−28·1*		−35·6*		−51·9*		−65·4*		Clipped, wheat. Control 6% lodging.
,, II	19·7		−14·5*		−21·9*		−43·0*		−60·0*		,, ,, ,, 100% ,,
,, III	26·0						− 3·2		−28·4*		,, ,, ,, nil ,,
,, IV (f)	30·0	32·5			− 3·3	− 6·5			−35·7*	−38·5*	,, W. barley ,, slight ,,
					STRAW YIELDS ONLY						
,, V (g)	19·2	—	−24%*								
	39·2						−43%*				Clipped wheat S.E. } { S.E. = Sown Aug.
	34·0								−47%*		,, ,, E. } { E. = ,, Sept.
											,, ,, L. } { L. = ,, Oct.
	23·2	—	+12%*								,, W. barley S.E. } { S.E. cuts taken 15 Oct.
	30·0						−15%*				,, ,, E. } { E. ,, ,, 16 April
	28·0									−53%*	,, ,, L. } { L. ,, ,, 6 May

* Significant difference at P=0.05

(a) Rothamsted Exp. Sta., 1930
(b) Robinson, 1951
(c) Connold, 1956
(d) Peto, 1952
(e) Holliday and Storey, 1946
(f) Bramley, 1951
(g) Holliday, 1951–6

Welton and Morris in Ohio (1931) showed that clipping wheat to 4 in. high in mid-April reduced yield by 13%, whereas clipping to 2·5 in. on the same date reduced it by 29%.

The influence of grazing and nitrogen upon grain yield

Several experimenters have shown that a nitrogen top-dressing after grazing or clipping increased grain yield. The results of such nitrogen applications in the British experiments are quoted in Table 2. It will be observed that, although nitrogen increased the yield of the grazed plots and therefore partially made good the negative responses, the yield was still low when compared with the non-grazed plus nitrogen plots. In fact the results obtained by Holliday at Leeds with winter barley are probably typical. This was a factorial experiment and there was no significant interaction between the two factors. A reservation must be made, however, in the case discussed in the next section, where the level of nitrogen is such as to cause lodging.

It is sometimes stated that a cereal crop will benefit from the manurial residues from the grazing animal. Unless supplementary feeding stuffs are also fed there is unlikely to be an overall gain, however, as grazing must result in a net loss of plant nutrients to the field.

The influence of grazing upon lodging

It is a common belief that grazing or cutting for forage has the effect of controlling lodging in a cereal crop. In fact, grazing as a possible control of lodging has been mentioned in most of the standard works on agriculture as far back as 1837 when the practice was recommended in chapter 10 entitled 'On Wheat' in *British Husbandry* in the series *Library of Useful Knowledge* (1837).

Figures showing the effect of defoliation on lodging have been obtained in the Indiana (Cutler *et al.*, 1949), New Jersey (Sprague, 1954) and Yorkshire experiments (Holliday and Storey, 1946). Less lodging on the grazed compared with the non-grazed plots has been reported in the Kesteven (Robinson, 1951) and the Wye trials (Peto, 1952). It is possible that increased grain yield could be obtained as a result of controlling lodging. Indeed this result was partially obtained by Sprague in New Jersey (1954) and by Cutler *et al.* in Indiana (1949). In the former case fall grazing controlled lodging and led to an increase in yield; spring grazing, although it controlled lodging had, however an adverse effect upon yield (see Table 1). In Indiana, early-spring grazing increased grain yield but did not control lodging; later-spring grazing increased yield and controlled lodging; still later grazing controlled lodging but reduced grain yield. The 1949 Kesteven experiment is of interest from the point of view of lodging and yield. The nitrogen in the non-grazed plot induced lodging and reduced yield. Grazing controlled this lodging and there was a 6% (non-significant) increase in grain yield.

As shown in the Indiana experiment, control of lodging by defoliation is by no means always accompanied by grain-yield increases. A further example is the second of the Wye trials quoted in Table 2 where a decrease in lodging on the grazed plots was insufficient to reverse the negative response in yield. Perhaps one of the most remarkable examples occurred in the second Yorkshire experiment quoted in Table 2. In this, *Cercosporella herpotrichoides* infected 83% of the stems and caused 90% (by area) lodging by July. The two early cuts had little effect upon lodging; the mid-April cut reduced it to 32% and the cut on 1 May to 5%. There were, nevertheless, severe reductions in grain yield at each cut. Subsequent experiments at Leeds (Holliday, 1951–6) have given control of moderate non-parasitic lodging, but again accompanied by losses in grain yield.

The effect of grazing on different cereals

Comparisons between the four cereals wheat, barley, oats, and rye have been made by several workers (Stansel *et al.*, 1937), (Washko, 1947), (*Bol. Chac. exp. la Previsión*, 1935–9), (Turpin and Marais, 1933). There is some evidence from these experiments to suggest that wheat is more resistant to the adverse effects of defoliation than barley, and the latter more than oats and rye. This result may, however, merely be a reflection of an intensity effect. That is to say the four cereals produce different quantities of herbage by the time the defoliating period is reached. Wheat often produces less than the others, and therefore, if all are defoliated to a standard height, has a relative smaller percentage of the total removed.

Varietal differences have also been reported by Thomas and Millington (1944), Sims (1943), Stansel *et al.* (1937) and by the Argentinian workers (*Bol. Chac. exp. la Previsión*, 1935–9).

Other effects of grazing upon cereals

In the few cases reported where straw yields have been taken as well as grain yields it has been found that the former are reduced by grazing to a rather greater extent than the latter. This was found by Holliday (1951–6) and Welton and Morris (1931). In both cases, both straw-numbers and straw-height were reduced. Reduction in the number of straws was also observed by Washko (1947) and Gough and Dunnett (1950). This latter fact is of interest because in some parts of the country there is a traditional belief that tillering can be increased by grazing cereals in the spring. Moderate grazing in the Kansas experiments, reported by Swanson and Anderson, (1951) did in fact increase the number of vegetative tillers. The

number of culms produced was nevertheless reduced by some 10%. Indeed it is well known that late-formed vegetative tillers often do not produce inflorescences.

Several workers have shown that grazing often causes delayed maturity in the crop. Washko (1947) found delayed maturity due to spring- and fall-grazing of 4–8 days. Finnell (1929) and Holliday (1951–6) also obtained delayed maturity in their experiments. On the other hand, Kiesselbach and Lyness (1948) found that fall pasturing did not delay maturity, whilst spring grazing caused a delay of 1–2 days.

(*To be continued*)

FIELD CROPS

CEREALS

WHEAT

676 MINISTRY OF AGRICULTURE, EGYPT. **Wheat in Egypt.** *Publ. Agric. Extn Dep. Minist. Agric. Egypt* 1955, pp. 8.

Brief mention is given of the history and characteristics of the common varieties grown in Egypt; Giza 139 and 135, Dakar 49 and 42, Baladi 116 and Mokhtar Improved. The cultural operations practiced are outlined.—M.P.

677 MCLENNAN, L. W. **Movements in wheat acreage in Australia.** *Quart. Rev. agric. Econ.* 1956, **9,** No. 1, 22–30, illus.

The differences in trends in acreage devoted to wheat growing in different parts of Australia from 1930 to 1955 are given, and a particular examination made of the changes occurring in the years 1949/50–1954/55. Probable reasons are advanced for some of these differences.—M.P.

678 SIMS, H. J. and ROONEY, D. R. **Wimmera cereal experiments. Crop rotation trials.** *J. Dep. Agric. Vict.* 1955, **53,** Pt. 7, 302–4, illus.

These trials, which have been conducted at the Longerenong Agricultural College, Victoria, since 1918, show that the average wheat yields are highest when the crop is preceded by bare fallow. Growing peas in place of the fallow reduced the subsequent wheat yield by 13·9 bu. per ac. The yield from stubble-sown wheat was less than half that obtained from bare fallow.—M.P.

679† VORKAČEV, G. G. [**Some results of the first year's utilization of virgin and waste lands in the Altaĭ.**] [Russian] *Agrobiologija* (*Agrobiology*) 1955, No. 3, 106–10. [Altaĭ Zonal Sci. Res. Inst. Agric. and Anim. Husb., Barnaul]

Cultural measures which have proved satisfactory when used on collective farms in different zones in the Altaĭ for the production of spring wheat are outlined. Yields are recorded of the varieties Albidum 3700 (medium ripening) and Milturum 553 and 321 (late ripening), depending on sowing date (during May). The maximum yield (3140 kg./ha.) was obtained from Albidum 3700 when sown between 1 and 5 May in the Aleĭsk steppe.—M.H.

680 KRIEGBAUM, H. Zur Frage der Ertragsänderung bei einigen Nutzpflanzen durch Beregnen zu verschiedenen Zeiten, unter besonderer Berücksichtigung der Ertragsstruktur von Winterweizen. [**Change in yield of crop plants by sprinkler-irrigation at different times, with special reference to yields of winter wheat.**] *Z. Acker- u. Pflbau* 1955, **100,** No. 1, 99–132, bibl. 48. [Inst. Pflbau Pflzücht., Landw. Hochsch., Hohenheim, Wurttemberg-Baden, W. Germany]

Experiments were conducted for 2 years on winter wheat, spring barley, beetroot, radish and beans, grown in (6 × 6) m^2. plots, the object being to find the growth stage for each crop at which sprinkling exerted the optimum influence on the crop yield. Since these were critical tests, small quantities of water were applied, i.e., two sprayings at 20 mm./ha. for each plot. Six growth stages were studied. There appears to be a narrow line between success and failure; good management is the vital factor.—D.B.

681 IRLENBUSCH, J. Herkunftswert und Ernteertrag beim Winterweizen. [**Provenance value and yield of winter wheat.**] *Dtsch. Landw.* 1955, **6,** No. 9, 427-33, bibl. 26, illus. [Karl-Marx Univ., Leipzig, E. Germany]

[See also *Fld Crop Abstr.* 8 : 1176.]

682 STAPLE, W. J. and LEHANE, J. J. **Weather conditions influencing wheat yields in tanks and field plots.** *Canad. J. agric. Sci.* 1954, **34,** No. 6, 552–64, bibl. 16. [Soil Res. Lab., Swift Current, Saskatchewan]

A report is given of the effect of precipitation, stored soil moisture, free water evaporation, air temperatures and hours of sunshine on the yields of wheat grown in soil tanks 15 in. diam. and 5 ft. deep, and in field plots in Saskatchewan over a 31-year period. Correlation coefficients between wheat yields and evapotranspiration in both tank and field-plot trials were about 0·9 and were highly significant. Regression coefficients showed that grain yields increased by 4·66 bu. per ac. for each additional inch of water used by crops grown in tanks, and by 3·96 bu. per ac. for crops grown in field plots. To produce any grain yields at all in tanks and field plots, 4·93 and 5·64 in., respectively, of evapotranspiration were needed. On field plots, yields were increased to a greater extent per inch of water used under conditions of high, as compared with low, rates of evapotranspiration. Evapotranspiration was the most important factor affecting wheat yields. The two components of evapotranspiration, seasonal rainfall and stored soil moisture, had nearly equal effects on yield. The effect of free water evaporation on yields was small, where differences due to variations in moisture use were eliminated. Yields on field plots were

significantly reduced by air temperatures above normal, or free water evaporation above normal. In tanks, above-normal air temperatures, only, significantly reduced yields.—P.J.B.

683 WÅLSTEDT, I. Svalöfs Drottvårvete, [**Svalöf Drott spring wheat.**] *Sverig. Utsädesfören. Tidskr.* 1955, **65,** No. 4, 245-56, bibl. 3, English summary

Drott, bred at the Östgöta Branch Station and put on the market in 1954, is a selection from a cross Fylgia I × Og 0990. It is medium-early and high-yielding. Trials show it to be superior to other Swedish spring wheats in the eastern part of central Sweden, but it is outyielded by some in the south-east and south of Sweden.—From author's summary.

684 WAGNER, S. "Cappelle," ein neuer Winterweizen auf dem Richtsortiment des Schweizerischen Saatzuchtverbandes. [**"Cappelle" a new winter wheat from the certified seed of the Swiss Association for Seed Production.**] *Mitt. schweiz. Landw.* 1955, **3,** No. 11, 161-9, illus. [Eidg. Landw. Versuchsanst., Zürich-Oerlikon, Switzerland]

During the past 4–5 years, Cappelle, a variety from northern France, derived from Vilmorin 27 × Hybride du Joncquois, has been compared with Probus and Mont-Calme 245. Because of its desirable properties, especially its high yields and resistance to lodging, it was placed on the official seed list for Switzerland in September, 1955. As a result of the trials reported in this paper, it is emphasized that good yields of Cappelle are obtained only under favourable conditions of soil, climate, nutrient supply and cultivation. As a highly-bred variety, it suffers under unfavourable conditions more than robust varieties. Fluctuation of characteristics should also be regarded as one of its properties. [See also *Fld Crop Abstr.* 9 : 13.]—D.B.

685 GRIFONI, E. Un nuovo grano duro per l'Italia meridionale. [**A new variety of durum wheat for southern Italy.**] *Genet. agr.* 1955, **5,** No. 1–2, 245–8, illus.

A description is given of the variety 235, also called Grifoni 235, which is probably a natural cross of Cappelli × Aziziah. Its stem is 80 cm. high, being 30 cm. shorter than that of Cappelli. 235 is 4–6 days earlier, and more productive, than Cappelli which is the variety of durum wheat mostly grown in southern Italy.—E.B.O.

686 DIRECTION DE L'AGRICULTURE ET DES FORÊTS, MOROCCO. Les variétés de céréales expérimentées par le Service de la Recherche Agronomique au Maroc. [**Cereal varieties tested by the Agronomic Research Service in Morocco.**] 1955, pp. 104.

A list is given of varieties of soft wheat (*Triticum vulgare*) and hard wheat (*T. durum*) which have been tested, or were still under trial in January 1955. The hybrids bred from these varieties at Rabat were included. The selected varieties released for cultivation are shown in capital italics ; those still under trial in small italics ; the other varieties listed are not considered of interest for Morocco. The scientific name of each variety, and the provenance of its seed, are given.—E.B.O.

687 BROWN, C. W. **Wheat varieties. Recommendations for 1956 sowings [in N.S.W.].** *Agric. Gaz. N.S.W.* 1956, **67,** Pt. 2, 58-66, illus.

Fifteen wheat varieties are recommended for 13 zones in the New South Wales wheat belt. Their main features, including time of maturity, grain quality and disease resistance are tabulated, followed by more extensive notes on each.—M.P.

688 HEERMANN, R. M. and STOA, T. E. **New durum wheats resistant to 15B.** *Bimon. Bull. N. Dak. agric. Exp. Sta.* 1956, **18,** No. 3, 75-80.

Descriptions are given of the varieties Langdon, Yuma, Ramsey and Towner, all of which are resistant to Race 15B of stem rust.—P.J.B.

689 WELLINGTON, P. S. **Studies on the germination of cereals. 1. The germination of wheat grains in the ear during development, ripening, and after-ripening.** *Ann. Bot., Lond.* 1956, **20,** No. 77, 105-20, bibl. 21, illus. [Official Seed Test. Sta., Cambridge]

The ability of individual grains to germinate in the ears of a red and a white wheat variety has been determined at different periods after anthesis, and at different moisture contents, before the stage of full maturity. No grains germinated while active growth was taking place, but after desiccation during ripening, 88·5 per cent of the white grains and 7 per cent of the red grains were able to germinate in the ear ; the percentage germination of the red grains increased to 83 per cent, when further desiccation occurred during the first 5 weeks of after-ripening, but some grains in the basal spikelets of the ears of both varieties failed to germinate until they had been subjected to the same desiccation from 13 to 23 weeks after anthesis. The ability of the grains to germinate has been correlated with their desiccation at different stages during maturation, and the effect of certain factors, which inhibit the germination of immature grains, are discussed in relation to varietal differences in the colour of the grains and their position in the ear.—Author's abstract.

690 MITCHELL, F. S. **The effect of drum setting and crop moisture content on the germination of combine harvested wheat.** *Rep. 51. NIAE* 1955, pp. 22, illus.

The purpose of the experiment was to measure the effect on germination of combine harvesting a crop of spring-sown Atle wheat at a number of drum speeds and concave settings over a range of crop moisture contents. The cleaned and dried grain was stored in sacks and in insulated containers in a store room maintained at a minimum temperature of 55°F. over the 6 months' storage period. A visual estimation of the percentage number of damaged grains in each treatment was made and a record of grain temperature kept. The results show that there was a marked falling off in germinative energy in grain harvested above 19% moisture content and in total germination above 22% moisture content. If the grain was stored in sacks there was sufficient recovery to bring wheat up to the same standard as that harvested at lower moistures. No such recovery took place for the same group stored in insulated containers.—Author's abstract.

691 SODERHOLM, L. H. and WALKER, E. R. **Effect of cathode rays on germination and early growth of wheat.** *Bot. Gaz.* 1955, **116,** No. 3, 281-90, bibl. 12, illus. [Univ. Nebraska, Lincoln]

The determination of the effect of cathode rays on the germination and early growth of wheat was part of a project to investigate radio frequency heating for the preservation and processing of agricultural products. The duration of radiation was 45 sec. None of the dosages used (10,000 to 200,000 reps) interfered with germination, but the higher the dose the greater was the harmful effect on subsequent growth. The fatal dose lies between 30,000 and 40,000 reps. In meristematic regions, the number of cell divisions was inversely related to dosage.—D.B.

692 HANADA, K. **On the change of the resistance to the toxic action of potassium chlorate in wheat seeds during their germination period.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 202-3, English summary. [Agric. Fac., Tokyo Univ. Education, Japan]

There is evidence that the resistance of germinating wheat seed to toxicity caused by $KClO_3$ is related to such factors as resistance to cold and differences between spring- and winter-types of wheat. Seed of winter wheat was germinated and subjected to treatment with 0·6% $KClO_3$ for 20 hr. at 20°C. when the coleoptiles of the germinated seed had reached different lengths. The further the process of germination had proceeded, the lower was the capacity to resist the toxic effects of $KClO_3$. Resistance to $KClO_3$ toxicity appeared to be associated with an initial rapid increase in the contents of reducing sugars and reduced ascorbic acid for about 4 days after germination began, followed by a progressive decline in the contents of these substances. For testing the resistance of seedlings to $KClO_3$ toxicity, a coleoptile length of 5–10 mm. appeared to be the best stage of development.—From author's summary.

693 WARD, R. K. **Wheat tolerance to hormone weedkillers.** *Proc. 8th N.Z. Weed Contr. Conf.* 1955, 114–18, bibl. 1. [Rukuhia Soil Res. Sta.]

The object of the experiment reported was to establish the tolerance of New Zealand's most important wheat variety, Cross 7, to MCPA and 2,4–D formulations, with special reference to such tolerance and plant growth stage. It is concluded that wheat can safely be sprayed with amine MCPA and amine salt of 2,4–D at the rate of 0·75 lb. per acre at any time up to the 10-leaf stage of growth, but it is inadvisable to apply ethyl ester of 2,4–D at this rate during the 4-leaf early tillering stage.—M.H.

694 VIGOROV, L. I. [**The extraction of nitrogen by weeds in spring-wheat sowings.**] [Russian] *Bot. Ž. (Bot. J., USSR)* 1955, **40,** No. 5, 703–5, bibl. 2. [Ural Forest/Tech. Inst., Sverdlovsk]

In the region of the Central Urals the spring-wheat crops are deficient in nitrogen. A study has been made of the ammonium- and nitrate-N contents (during the crop's vegetative period) of the soils under the spring wheat Diamant in the Sverdlovsk Province. The work has shown that the weed flora absorbs a great part of the N in the soils. The amount of N absorbed by different weed species at the beginning of flowering varies from 65 mg. per plant in *Equisetum arvense* and 67 mg. per plant in *Chenopodium album* to 955 mg. per plant in *Artemisia absinthium* and 396 mg. per plant in *Polygonum latifolium.*—M.H.

695 LUTHRA, J. C. **Solar energy treatment of wheat loose smut (*Ustilago tritici* (Pers.) Rostr.).** *Indian Phytopath.* 1953, **6,** No. 1, 49–55.

Effective control of loose smut was obtained by soaking wheat seed in water for 4 hr., followed by exposure of the seed to direct sunlight (in India) for 4 hr. The seed was dried in the shade after treatment.—P.J.B.

696 KOCHAN, W. J. **The effects of different nutritive levels of copper on the growth of wheat, *Triticum vulgare*, and on the activities of terminal oxidases of wheat seedlings.**

Diss. Abstr. 1955, **15,** No. 12, 2393–4. [Rutgers Univ., New Brunswick, New Jersey]

697 SINGH, R. M. **Effect of iron on leaf area of wheat plant.** *Sci. and Cult.* 1955, **21,** No. 6, 318–19, bibl. 2. [Agron. Sect., B.R. Coll., Agra]

In water-culture experiments with wheat, iron, supplied for the first 20 days only, increased the leaf area significantly. Increasing this initial period of supply up to, but not beyond, the 80th day, significantly increased leaf area. Plants receiving iron from the 20th to the 80th day only acquired a leaf surface equal in area to that of plants receiving iron for the first 60 days only. It was inferred that the presence of iron in the cultures between 40 and 80 days, and particularly between 60 and 80 days, was essential. A concentration of iron greater than 3·22 ppm. of solution did not further benefit the plants in any of the experiments.—P.M.G.

698 HÄNSEL, H. Entwicklungs-Relationen ertragbildender Organe von Winterweizen (und Winterroggen) und ihre Bedeutung für Termine zusätzlicher Nährstoff- und Wassergaben. [**Developmental relationships of those organs which contribute to the yield of winter wheat (and winter rye) and their importance for dates of application of nutrients and irrigation water.**] *Z. Acker- u. Pflbau* 1955, **100**, No. 1, 77–98, bibl. 31, illus. [Probstdorf Saatzucht-Station, Lower Austria]

With the object of establishing some basic rules for dates of application of fertilizers and irrigation water, winter wheat and winter rye were sown in the open in autumn and the course of development of the yield-determining organs, viz. shoot axis, spike, spikelet and flower, was examined by botanical analyses at 10- to 20-day intervals beginning at the end of the following March. By determining the number of shoots per plant, spikelets per spike and flowers per spikelet, 4 periods in development of these yield-determining organs were distinguished : (1) the laying down of the organs ; (2) maximum number of organs (of one kind) ; (3) reduction in number of organs ; (4) final number of organs and their maturity. The timing of these stages for each of these organs reveals a pattern of regular, developmental relationships within the development of the whole organism. For each of these organs, there were stages of development before which the addition of nutrients influenced the crop yield and after which this was no longer possible. Such " limiting stages" can be recognized by external features of the plant.—D.B.

699 KOSTRUBIN, M. V. [**The formation and transformation of hemicelluloses in wheat stems.**] *Biohimija* (*Biochemistry*) 1955, **20,** No. 3, 360-7, bibl. 16, illus. [Chem. Dep., Orlov State Pedagogic Inst.]

The study is concerned with the chemical composition of the carbohydrate complex in wheat stems during development of the plants. There is evidence that an accumulation of cellulose in the stems occurs only up to the period of wax ripeness of the grain, after which the amount diminishes.—M.H.

700 PETRUCCI, D. Respirazione in funzione della concentrazione di O_2 e ossidasi. 1. Definizione chimico-fisica dei rapporti tra respirazione ed ossidasi e ricerche su *Triticum vulgare*. [**Respiration as a function of O_2 concentration and oxidases. 1. Chemico-physical definition of the relationship between respiration and oxidases, and investigations with *Triticum vulgare*.**] *Ric. sci.* 1955, **25,** No. 12, 3356-66, bibl. 6, English, French and German summaries. [Ist. Zool., Rome Univ.]

The research programme, of which this paper gives first results, was designed to study the relationship between the capacity of various organisms to tolerate low 0_2 concentrations and the chemico-physical properties of oxidases.—From author's summary.

701 JASTREBOV, M. T. [**Respiration intensity of roots, tillering nodes and leaves of spring wheat in relation to conditions of nutrient supplies.**] [Russian] *Doklady Akad. Nauk SSSR* (*Proc. Acad. Sci. USSR*) 1956, **106,** No. 1, 148-51, bibl. 13. [Timirjazev Inst. Pl. Physiol., Acad. Sci. USSR]

This study was made with the Lutescens 62 variety of spring wheat, grown on 225 m.^{2} plots of black-earth soil in the Stony Steppe, with fertilizers : (1) applied before autumn ploughing and (2) drilled 1·5 to 2 cm. under the seed when sown. Soil monoliths were collected (Jastrebov's method, recently described in *Pedology* 1955, No. 5) and the respiration of the various organs was determined by Boysen-Jensen's method (*Planta* 1926, Vol. 6, No. 3) as modified by S. V. Tageev. There is evidence that, at the stage of milk-ripeness, respiration (in mg. CO_2/hr./g. dry wt.) at 26°C. on the open steppe (27 June, 1951) by the seminal roots in various soil horizons (0–40 cm.) increases, the greater the soil depth at which the roots occur, e.g. from 2·97 (0–8 cm. depth) to 10·05 (17–40 cm. depth) when unfertilized ; from 2·62 to 6·0 ($N_{15}P_{45}K_{45}$ applied in autumn) ; and from 1·77 to 3·1 ($N_{15}P_{30}K_{30}$ applied in autumn, with further $N_{15}P_{15}K_{15}$ at sowing time). The respiration intensity is lowest in the seminal roots when the

plants receive optimal nutrition. Data obtained from plants protected by a shelterbelt confirm these results. In 1953, data on the respiration intensity of leaves, tillering nodes and seminal roots as affected by NPK (applied at different times and rates) show that, at the tillering phase, the respiration intensity of all these organs was 16–18% greater in the unfertilized controls compared with the fertilized plants. This is attributed to the relatively large expenditure of highly active nutritive substances by the tissues of the unfertilized plants and a predominant absorption of elements from compounds which are in a form not readily available. The lower expenditure of CO_2 in fertilized plants is accompanied by an increase in productivity (grain yield being 1363 kg./ha. in unfertilized controls, compared with 1608 kg./ha. when $N_{15}P_{30}K_{30}$ is applied to plots in autumn, in addition to P_{10} at sowing time).—M.H.

702 ČAĬLAHJAN, M. H. and KUZNECOVA, M. S. [**The effect of nicotinic acid and thiourea on vernalization of winter grasses.**] [Russian] *Doklady Akad. Nauk SSSR* (*Proc. Acad. Sci. USSR*) 1955, **105,** No. 4, 842-5, bibl. 19, illus. [Timirjazev Inst. Pl. Physiol.]

There is a weight of evidence to support the view that the vernalization of winter plants is related to oxidation-reduction processes and the activity of hydrolytic ferments. In 1954–5 at the above Institute, the influence of various substances in solution on the vernalization of the winter cereals Vjatka rye and Ukrainka wheat was investigated. Seeds of these plants were soaked in the solutions (see below) at room temperature for 15 hr., after which they were placed on filter paper moistened with the same solutions and then transferred to a thermostatically controlled cabinet at 0–5°C. The seed was vernalized for 40 days. During the first year (1954) vernalization was interrupted periodically by higher temperatures, but in the second year (1955) vernalization proceeded without interruption. At the end of vernalization, the germinating seed was planted in soil in clay pots and grown in natural day. In the 1954 tests the vernalized seed was treated with the following substances in solution : (1) potassium permanganate, 0·05% concentration ; (2) pyrogallol, 0·05% ; (3) hydrogen peroxide, 0·05% ; (4) boric acid, 0·01% ; (5) nicotinic acid, 0·1% ; and (6) thiourea, 0·01%. The control comprised vernalized seed on filter paper moistened with tap water and treated with all the solutions. The seed was sown in vessels, two vessels for each variant, at the completion of vernalization (6 May). Phenological observations showed that plants from vernalized seed treated with (1), (2) and (3) differed little from the controls. These results do not support the conclusions of Školjnik and Stelkova [*Fld Crop Abstr.* 8 : 1097]. Treatments (5), (6) and (4) accelerated vernalization, flowering in Vjatka, for example, being 10 days in advance of the control for (5), 6 days in advance for (6) and 5 days for (4). Similar results were obtained with Ukrainka wheat. In 1955, tests were made of the same substances in two concentrations as follows: (a) nicotinic acid, 0·1% and 0·5% ; (b) thiourea, 0·1% [in text given as 0·1 %, in table as 0·01%] and 0·05 % ; (c) boric acid, 0·01% and 0·05% ; (d) control. At the end of vernalization (7 May), germinating seed was sown in soil in clay pots, each variant comprising 4 pots with 5 plants in each. The data show that (c) did not have any stimulating effect on development of the rye plants, and even depressed wheat development ; (a) and (b) hastened development, but in rye this was less marked than in the 1954 tests and in wheat it was much greater with the higher concentrations. There is evidence that weak concentrations of (a) and (b) accelerate plant development, but this acceleration varies, depending on meteorological conditions during the vegetative period. It is concluded that the stimulating action of (a) and (b) on the vernalization of winter cereals is explained by their role in fermentation processes. —M.H.

703 CHINOY, J. J. **Determination of photothermic and vernalization quanta for the vegetative period of wheat.** *Physiol. Plant.* 1956, **9,** No. 1, 1–18, bibl. 34. [Univ. Delhi, India]

The studies reported were made to determine the quantitative relationships between vernalization and photoperiodic treatments as they affected the vegetative development of a number of Indian and exotic wheat varieties. Three separate experiments were carried out. In the first experiment, only one variety, N.P. 52, was used ; in the second, 7 with vegetative periods ranging from 80 to 105 days, and in the third, 12 with vegetative periods ranging from 99 to 162 days, were used. In the second and third experiments, vernalization treatment was carried out by holding seed, from which the coleorhiza had emerged, at 3–5°C. for 38 or 45 days. In the photoperiod treatments made to seedlings, short daylengths of 6 or 7 hr., normal daylengths of 11 hr. and long daylengths of 24 hr. were used. Vegetative periods were determined by noting the dates of anthesis. A highly significant inverse correlation was found between photo and thermal quanta in their effect on the vegetative development of the variety N.P.52. Data are given of the photothermic quanta of this variety, and of the mean vegetative periods, regression equations, and mean values of experimentally and statistically determined photothermic and vernalization quanta, for vernalized and unvernalized plants of the varieties used in the second and third experiments. There was evidence that the efficiency of utilization of photothermic energy increased with ver-

nalization. The difference between the photothermic quanta of vernalized and unvernalized plants was designated the vernalization quantum of a variety. The value of the photothermic quantum increased with the length of the vegetation period of a given variety. The progressive increase in the photo and thermal quanta of unvernalized varieties as their vegetative periods lengthened held good under all three daylength treatments ; this was also the case with vernalized varieties, with the exception of 3 winter-wheat varieties, which showed an interaction between photoperiodic and vernalization treatments. Though both the thermal and photo quanta of varieties increased with the length of the vegetative period, these values for any given variety were inversely correlated. The following equation was deduced to express the relation between the photothermic quantum of a variety (E), the length of its vegetative period (F), the mean temperature (t) during its vegetative period and the mean photoperiod (p) : $PT=ptF^2$. It is suggested that the photothermic and vernalization quanta of varieties, as elaborated in this paper, are useful indices of the energy requirements of long-day plants.—P.J.B.

704 STROM, M. A propos du photostade du blé " Fylgia." [**Concerning the photoinduction of Fylgia wheat.**] *Bull. Soc. bot. Fr.* 1955, **102,** No. 7–8, 318–22.

During the 1953–4 season in France, Fylgia, unlike other spring wheats, survived the winter frosts when sown in early November. When sown in early April, Fylgia headed only sporadically in early August and did not head at all when sown in early May. It was concluded that Fylgia required lower temperatures than those of early May to complete thermal induction, under the conditions of these trials, and is not a true spring wheat. In trials with Hauter's II, Fylgia and Mahmoudi 552 spring wheats, the latest sowing dates to ensure heading were 18 March and 5 April for Hauter's II and Fylgia, respectively. In further trials, Fylgia and Mahmoudi III were grown under either natural daylength, or 24 hr. photoperiods, and were vernalized by cold treatment, or left untreated. The seed was soaked and sown on 15 June. Fylgia did not react to the vernalization treatment. Under 24 hr. photoperiods, both Fylgia and Mahmoudi III headed. Under natural daylengths, Fylgia did not head, while Mahmoudi III did. Thus, it was concluded that Fylgia was an interchangeable variety, in the sense of Fedorov. —P.J.B.

705 GRIES, G. A. and others. **Responses of spring wheat varieties to day-length at different temperatures.** *Agron. J.* 1956, **48,** No. 1, 29-31, bibl. 11. [Bot. and Pl. Path Dep., Purdue Univ., Lafayette, Indiana]

Four varieties of spring wheat were grown under controlled conditions of temperature and photoperiod. All varieties flowered over the entire range of day-lengths used, but became progressively earlier as the photoperiod was increased from 8 to 24 hours. Although this species is frequently listed as a " long-day" plant, it is apparent that the effect of photoperiod on its flowering habit is not qualitative but quantitative. One variety of spring wheat, Chinese, was markedly less sensitive to photoperiod than were the others. As a result of the relative insensitivity of Chinese to photoperiod, it is the earliest of all wheat varieties tested when grown at short days (8 to 10 hr.) and under cool temperatures (50 to 70°F.). As the temperature is increased to 80°F., or the photoperiod is increased to 16 or more hours, it flowers with the latest of the other varieties. When the data are plotted to show the total hours of illumination to flowering as a function of photoperiod, it is established that Chinese flowers with the fewest total hours of illumination when grown under a short day. The number of hours of illumination to flowering increases as the photoperiod is lengthened. For the other 3 wheat varieties, the fewest number of hours of illumination are required when the plants are grown under a 16-hour day. More light is required as the day-length is either increased or decreased. The increase in total hours of illumination required for flowering with increase in daylength is taken as evidence that a dark period is important for maximum efficiency in the utilization of light. The flowering habits of the varieties in the field and the diverse earliness of different lines of winter habit derived from crosses of Chinese with winter wheats are explained in light of the data obtained.—Authors' summary.

706 NAKAYAMA, H. and SAWAMURA, H. **Effects of high night-temperature upon the development of wheat.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 178–82, English summary. [Nat. Inst. Agric. Sci., Tokyo]

Spring- and winter-wheat were grown in two greenhouses, one of which was maintained at a night temperature 6°C. higher than the other, which was maintained at normal temperatures. The treatments were initiated in both types of wheat either before, or after, spike initiation. The winter-wheat variety used was also subjected to different degrees of completeness of the vernalization process. High night-temperatures promoted the growth of both types of wheat, particularly in the case of the spring wheat, and, in the case of the winter wheat, only where the vernalization process was complete. With spring wheat, high night-temperatures before spike initiation increased leaf

numbers. When the treatment started after spike initiation, plant height and tiller numbers were increased. With winter wheat, the same trends were also noted, but they were not so clear-cut. Treatment which was started after spike initiation decreased grain numbers per ear, ear numbers and ear length in spring wheat ; in winter wheat, ear weights and grain numbers were decreased.—From authors' summary.

707 DULAC, J. Diagnostic foliaire des céréales. 5. Intérêt de la relation "azote-rendement" comme élément d'appréciation de la cinématique de l'alimentation azotée chez le blé (production du grain). [**Foliar diagnosis of cereals. 5. The value of the " nitrogen-yield" relationship as a means of assessing the status of the nitrogen supply of wheat (grain production).**] *C.R. Acad. Agric. Fr.* 1956, **42,** No. 2, 112–15, bibl. 2.

See also *Fld Crop Abstr.* 8 : 1190 and 9 : 411.]

708 LIVENS, J. Le rendement du froment en fonction du pH et de la teneur en K. [**The yield of wheat in relation to pH and potassium content of soil.**] *Agricultura, Louvain* 1956, **4,** No. 1, 81–98.

The optimum soil pH for wheat growing on a loess silt was between 7·0 and 7·4. When the soil pH fell below 6·5 or, on soils poor in K, rose above 7·9, the wheat yield was reduced.—D.B.

709 CHAVES S., M. and GONZÁLEZ G., F. Experiencias con fertilizantes en suelos arcillo-limosos de la provincia de Sevilla. Cultivo de trigo en secano. [**Manurial trials in clay-silt soils in Seville Province. Wheat cultivation on non-irrigated land.**] *An. Edafol. Fisiol. veg.* 1955, **14,** No. 5, 295-310, bibl. 6, German summary.

Results from manurial trials with wheat grown in soil poor in both nutritive elements and organic matter indicated that applications of P gave highly significant increases in yield, while N gave significant increases. K manuring did not increase yields significantly. N+P manuring was the most advantageous as it increased yields by 52% over the control. The application of P and K increased the content of these elements, and of ash, in wheat. The application of N increased considerably the content of N in wheat, but lowered its content of P, K and ash.—E.B.O.

710 MCCANN, J. MC. **Fertilizer trials on sandhills in the Northern Mallee.** *J. Dep. Agric. Vict.* 1956, **54,** Pt. 1, 7-13, illus.

As a result of trials on very light sandhills in the Walpeup district of Victoria, carried out from 1950–4, it is recommended that a dressing of at least 120 lb. per ac. of a 1 : 1 mixture of sulphate of ammonia and superphosphate should be applied to wheat sown on light sandhills in the northern portion of the Mallee. In the trials, such a mixture increased yields and assisted protection against erosion. Little or no response was obtained from trace-element dressings.—M.P.

711 BAKER, V. H. and others. **Some effects of microwaves on certain insects which infest wheat and flour.** *J. econ. Ent.* 1956, **49,** No. 1, 33–7, bibl. 9, illus. [Michigan Agric. Exp. Sta.]

Trials were carried out to study the effects of 12·25 cm. microwaves on the granary weevil (*Sitophilus granarius*) and the flour beetle (*Tribolium confusum*) infesting wheat and flour, respectively. The samples were irradiated in the Radarange equipment. When microwave energy is absorbed by matter, most of this energy is transformed into heat. It was found necessary to heat the total mass of wheat and flour to a lethal temperature before all insects were killed. A temperature of 172°F. with an exposure time of 15 sec. was lethal to 100% of the adult granary weevils 1 week after treatment. No eggs hatched after this treatment. [See also *Fld Crop Abstr.* 7 : 1133 and 1134.]—E.B.O.

OATS

712 WIGGANS, S. C. **The effect of seasonal temperatures on maturity of oats planted at different dates.** *Agron. J.* 1956, **48,** No. 1, 21–5, bibl. 13.

The accumulation of temperature over 40°F. required to mature a given variety of oats was found to be about the same for seedings made in April or early May. Early-maturing varieties required fewer heat units to reach maturity than late-maturing varieties. Very late-planted oats, which are exposed to infection from rusts and other diseases causing premature ripening, required somewhat fewer heat units. There was a definite decrease in yield from oats seeded after the middle of April. Data from several years indicate there is very little variation from year to year in the number of heat units required for a specific variety to reach maturity. Some variation may be caused by incidence of disease, rainfall, soil type, fertility level, depth of planting and plant population. However, temperature seems to be the primary factor affecting maturity. Oats planted over an 8-week period in the early spring, when temperatures are relatively cool, will generally ripen during a 2-week period in July at Ames, Iowa. Thus a 3- to 4-day delay in seeding represents approximately a 1-day delay in maturity.—Author's summary.

713 HODGSON, H. J. **Effect of seeding rates and time of harvest on yield and quality of oat-pea forage.** *Agron. J.* 1956, **48,** No. 2, 87–90, bibl. 6. [Agron. Dep., Alaska Agric. Exp., Sta., Palmer]

A number of oat/pea mixtures was drilled in 1951-3 in 6 ft × 80 ft. plots, each of which were divided into 5 sub-plots for harvest at the following stages of maturity : (1) oats, early milk stage ; peas, lower pods one-half filled ; (2) oats, milk stage ; peas, lower pods well-filled ; (3) oats late milk to early dough stage ; peas, middle pods well-filled, lower pods turning light green ; (4) oats, dough stage ; peas, upper pods well-filled, middle pods turning light green ; (5) oats, late dough stage, leaves turning yellow ; peas, all pods well-filled, most pods turning light yellow. Cutting at stage (3) produced the most satisfactory combination of dry-matter yield and dry-matter percentage, which must not be over 30% at cutting time, to allow a 10% wilting loss and to discourage mould development in the silage. At later stages, higher dry-matter content offset the higher protein yield and protein percentage obtained. From the 4 tables of yields, it was considered that the most profitable production was achieved by using mixtures with 50–65 lb. of peas and 35–50 lb. of oats. Total rates of seeding in excess of 100 lb. did not appear warranted.—P.M.G.

714 BROWN, C. W. **Oat and barley varieties. 1956 sowing recommendations.** *Agric. Gaz. N.S.W* 1956, **67,** Pt. 1, 24–5, 51-2, illus.

Notes are given on 10 oat varieties recommended for 13 zones in New South Wales. Five suitable barley varieties are also mentioned.—M.P.

715 MCINTOSH, T. P. **Identifying Svalöf oat varieties by grain characters.** *J. Inst. Corn agric. Merch.* 1956, **5,** No. 3, 119-26, illus.

This is the first of a series of articles on the identification of grain of certain groups of oat varieties. The Svalöf varieties Blenda, Eagle, Golden Rain II, Lightning, Star, Sun II and Victory are considered. The characters of grain and groat useful in diagnosis are described and tabulated, emphasis being placed on the most useful characters for discriminating within this group.—M.P.

716 SCHRANK, A. R. and others. **Growth characteristics of *Avena* seedlings grown from gamma irradiated seeds.** *Growth* 1955, **19,** No. 4, 287-96, bibl. 11. [Zool. Dep., Univ. Texas]

717 WIGGANS, S. C. and FREY, K. J. **Photoperiodism in oats.** *Proc. Iowa Acad. Sci.* 1955, **62,** 125-30, bibl. 7. [Agron. Dep., Iowa State Coll., Ames]

The studies reported were made to determine the effect of different photoperiodic treatments on date of heading, tillering and height of oats. Varieties used were Bond, Clintland, Mo 0–205, Simcoe and Victorgrain, grown in pots. Photoperiods used were 24, 18, 15 and 9 hr. and 9 hr. + 1 hr. at midnight ; the plants were kept in greenhouses maintained at either 70°F., or 57°F., for 90 days from sowing to harvest. No plants headed under 9 hr. photoperiods. Days from sowing to heading ranged from 58 to 67 under the 9 + 1 hr photoperiods and from 39 to 56 under continuous daylight, in temperatures of 70°F. In general plants took 10–12 days longer to head in temperatures of 58°F. than at 70°F. The average number of heads produced per plant at 70°F. ranged from 1·3 to 2·3 under 9 + 1 hr. photoperiods, and from 2·3 to 3·5 under 25 hr. photoperiods. At temperatures of 58°F., head numbers ranged from 0·8 to 1·9 under 9 + 1 hr. photoperiods and from 2·1 to 3 under 24 hr. photoperiods. There were highly significant differences between varieties and between treatments. Interactions between photoperiodic treatment and varietal response were not significant. Short photoperiods produced the highest numbers of potential head-producing tillers ; temperature had little influence on this effect. Oats could be classed as long-day plants, since they did not produce seed under photoperiods of 9 or 12 hr., without interruption of the dark phase by a short period of light. Under 18–24 hr. photoperiods, up to 4 generations of oats per year can be produced.—P.J.B.

718† WALLACE, A. T. and CHAPMAN, W. H. **Studies in plot technique for oat clipping experiments.** *Agron. J.* 1956, **48,** No. 1, 32–5, bibl. 6, illus. [Agron. Dep. and N. Florida Agric. Exp. Sta., Gainesville]

Clipping experiments were designed to simulate grazing. Two-years' uniformity data were used to estimate soil heterogenity indexes, which were used, along with cost functions, to estimate plot size. The optimum plot size was found to be 1 row of oats 8 ft. long. Conclusions based on the estimated coefficients of variation indicated that 4 or 5 replications are required to give a suitable degree of accuracy in clipping oats. Analyses of variance on data from an experiment planted to 3 varieties of oats in plots using 9 and 18 in. row widths at 2- and 4-bushel seeding rates indicated that the relative performances of these varieties were the same at both spacings and at both seeding rates.—From authors' summary.

RYE

719 KLITSCH, C. Der Saattermin der Winterungsarten (III Teil). [**Sowing dates of overwintering species (3).**] [*Dtsch. Landw.* 1955

6, No. 9, 425-7. [Friedrich-Schiller Univ., Jena, E. Germany]

Winter rye is not so limited in its range of sowing dates as is winter barley ; hence there are fewer failures caused by sowing at the wrong time. Nevertheless, there is a time range for sowing, determined by climate and soil, within which optimal yields are obtained and after which yields fall. In south Thüringen the sowing date for optimal yields lies between 25–30 Sept. on the plain and 20–25 Sept. in the more raw climate of high altitudes. In north Thüringen the optimal time for sowing on hills, valleys and plains is end of Sept. ; in the plain, rye can be sown even as late as 10 Oct.—D.B.

720† NICHOLSON, A. H. **Early bite from winter rye.** *Fmr and Stk-Breed.* 1956, **70,** No. 3469, 44.

The advantages are given of growing winter rye in Glamorgan in order to provide spring grazing. —C.L.S.

721 HOFMANN, E. and SCHMELING, B. Der Einfluss der Kalidüngung auf Ertrag und Qualität des Sommerroggens. [**The effect of potassium fertilizer on yield and quality of spring rye.**] *Z. Pflbau* 1955, **6,** No. 4, 161-7, bibl. 19. [Tech. Hochsch. München Weihenstephan, Bavaria, W. Germany]

In 4-year trials with spring rye on a soil of humus, lime and sandstone, P and N fertilizers were kept constant while K was given at rates of 60 and 120 kg. K_2O/ha. On this soil, the increase in K benefited the crop in several respects : assimilation was improved ; stalks were more resistant to lodging ; the 1000-grain weight was higher ; and grains contained a higher starch content and a lower protein- and free- enzyme content. This last-named quality improved the baking quality of the rye and lessened the likelihood of sprouting of the grain in damp weather. Germination capacity was not reduced.—D.B.

BARLEY

722 LAUMONT, P. L'orge de brasserie en Algérie. [**Malting barley in Algeria.**] *Bull. Éc. Brass., Nancy* [n.d.] No. 7, pp. 7. [Serv. Exp. Agric., Algeria]

Barley is grown on about 1,200,000 ha. in Algeria, being well adapted to the difficult conditions of the High-Plateaux. The total production fluctuates from one year to another, e.g. 113,800,000 kg. in 1945 (130 kg. per ha.) and 1,060,600,000 kg. in 1939 (860 kg. per ha.). Because of the decreasing demand for feeding barley, it will be difficult to dispose of the whole production in peak years. As the barley area cannot be easily reduced, a possible solution is to replace the types now grown by malting barley. Information is given on the work done in this connexion, particularly variety testing.—E.B.O.

723 CALDWELL, F. Y. K. and DAVIES, A. C. W. **The effect of heating and chilling as a means of overcoming dormancy in barley.** *Tech. Mem. 123. N.A.I.E.* 1955, pp. 5.

If a 72-hr. count is to be regarded as a measure of germinative energy, then chilling for 72 hr. at 5°C., preferably with the grains already sown in moist sand, is the more satisfactory method of breaking dormancy. Heating for 72 hr. at 38–40°C. in all instances suppressed germination, especially with grain harvested at higher moisture levels. If only a final germination at 7 days is required, then both methods are equally satisfactory, with the possible exception of the heat treatment in open tins.—From authors' summary.

724 JOHNSON, L. P. V. and OBOLENSKY, G. **Note on the effect of ultrasonic vibration on development of barley.** *Canad. J. agric. Sci.* 1954, **34,** No. 6, 651–2. [Pl. Sci. Dep., Univ. Alberta, Edmonton]

Seed of Olli and Montcalm barley was sprouted in a germinator for 48 hr. before exposure to ultrasonic vibration at an intensity of 5 W. per $cm.^2$ at a frequency of 800 k/c for 6, 12 or 18 min. The 6-min. treatments resulted in significantly earlier heading in all cases, compared with untreated controls. Treatment for 12 or 18 min. damaged the seed of Olli in some cases, but resulted in constantly earlier heading in Montcalm.—P.J.B.

725 HEBERT, T. T. **Mode of action of the wet anaerobic storage treatment for the control of loose smut in barley.** [Abstract] *Phytopathology* 1956, **46,** No. 1, 14.

Ustilago nuda in barley was controlled by soaking the grain at room temperatures for 15 min. to 4 hr., followed by storage in air-tight containers for 36 hr. at 32°C., for 48 hr. at 28°C., or for 60 hr. at 24°C. —P.J.B.

726 PORTER, R. H. **Seed treatment tests for control of barley loose smut.** *Pl. Dis. Reptr* 1956, **40,** No. 2, 106-11, bibl. 9. [Colorado Agric. Exp. Sta., Fort Collins]

The results are presented of seed-treatment trials during 1954–5. Good control of *Ustilago nuda* in barley was secured by soaking the seed in water for 2 hr., followed by placing the seed in a sealed container for 23 hr. before drying, or by soaking in a solution of 0·18 ml. Panogen in 130 ml. water, or a 2% suspension of Spergon, for 2 hr., followed by sealing for 23 hr. Spergon dust did not remain in suspension well. Panogen is effective for controlling *U. hordei* and *Helminthosporium gramin-*

eum and for giving partial control of *H. sativum*. In a trial with 5 barley varieties, the seed was soaked for 4 hr. in solutions of 0·15 ml. Panogen in 150 ml. water, per 125 g. seed. The seed was then corked in flasks for 36 hr. at a temperature of 80°F., before drying. No noteworthy reduction in germination was caused by the treatments.—P.J.B.

727 PORTER, R. H. **Seed treatments for stripe and covered smut of barley.** *Pl. Dis. Reptr* 1956, **40,** No. 2, 112-17. [Colorado Agric. Exp. Sta., Fort Collins]

The results are given of trials during 1954 and '55 on the use of a number of relatively new fungicides for treating barley seed for the control of *Helminthosporium gramineum* and *Ustilago hordei*.—P.J.B.

728 SCHULTE, H.-K. Untersuchungen zur Genetik und zur physiologischen Funktion der Granne bei der Gerste. [**An investigation into the genetics and physiological function of the awns of barley.**] *Z. Pflzücht.* 1955, **34,** No. 2, 157–96, bibl. 53, illus. [Max-Planck-Inst. für Züchtungsforschung Voldagsen über Elze, W. Germany]

The relationship between 1000-grain weight and awns is discussed in the section on the physiological function of awns.—D.B.

729 SUBBA RAO, M. S. and LAL, K. N. **Deficiency and toxicity effects of manganese on the physiology of barley.** *Sci. and Cult.* 1955, **21,** No. 6, 319–20, bibl. 3. [Plant Physiol. Lab., Banaras Hindu Univ.]

730 FUJIWARA, A. and TSUTSUMI, M. **Biochemical studies of microelements in green plants. 1. Deficiency symptoms of microelements on barley plants and changes of indoleacetic acid and oxidase activity.** [Japanese] *J. Sci. Soil, Tokyo* 1955, **26,** No. 7, 259-62, bibl. 7, English summary. [Agric. Fac., Univ. Tôhoku, Japan]

Data are given of the growth of barley after one month of treatment, and of the IAA oxidase activity of root tissue homogenate, of plants grown in nutrient solutions from which Fe, Mn, Zn, Cu, Mo and B were individually omitted. Plants grown in solutions deficient in Cu or Mo showed levels of IAA oxidase activity 20 and 8%, respectively, below that of controls grown in complete nutrient solutions. Those grown in solutions deficient in Fe, Mn, Zn and B showed IAA oxidase activities as high, or nearly as high, as that of controls. Restoring Cu to the Cu-deficient nutrient solutions resulted in almost complete restoration of IAA oxidase activity, but not in cases where Mo was restored. It was concluded that IAA oxidase was a Cu protein substance and that Mo was concerned in the synthesis of IAA oxidase.—From authors' summary.

731 WILLIAMS, R. F. and SHAPTER, R. E. **A comparative study of growth and nutrition in barley and rye as affected by low-water treatment.** *Aust. J. biol. Sci.* 1955, **8,** No. 4, 435-66, bibl. 25, illus. [Waite Agric. Res. Inst., Univ. Adelaide]

A comparative study of growth and nutrition in barley and rye was made with two water treatments. The low-water treatment was intermittent and harvests were made after each of the 5 periods of water stress. Yield reductions due to low-water treatments were highly significant at all 5 harvests and for both species. The severity of the effects on various plant parts was conditioned by the stage of development of those parts. The immediate response of plants to low-water treatment was a reduction in the root weight ratio, this effect was later reversed in barley but not in rye. The inflorescence weight ratio was reduced by treatment in barley but not in rye. Stem height was unaffected by low-water treatment in rye but was reduced in barley. There was a tendency for N to be excluded from the leaves and to accumulate in the stems as a result of wilting. P intake by the shoots was considerably reduced by low-water treatment and there were initial decreases in relative leaf P for both species. This effect was reversed later. The relative contents of K, Ca and Mg were increased by treatment in the tissues of barley, but less in rye, the latter also absorbing much less Na than did barley, with chemically equivalent but relatively smaller differences in Cl intake. There was also evidence for selective absorption of Mn, relative contents being higher in rye than in barley. It was found that those plant parts which grew most actively during the period of low-water treatment suffered the greatest check to their growth and many effects on the ratios of plant parts are indirect consequences of this. Distribution indices for dry-weight changes showed small immediate effects of treatment ; the exceptional behaviour of rye in this respect is thought to be relevant to its drought resistance.—From authors' summary.

732 ARIKADO, H. **Studies on the development of the ventilating system in relation to the tolerance against excess-moisture injury in various crop plants. 6. Ecological and anatomical responses of barley and some forage plants to flooding treatment.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **24,** No. 1, 53–8, illus., English summary. [Agric. Fac., Univ. Mie, Japan]

Species used in these studies were : barley, *Poa pratensis*, *Trifolium hybridum* and *Astragalus sinicus*. The plants were grown in pots in green-

houses, in soil which was flooded for different periods. Barley plants flooded from the tillering stage until they died were able to adapt themselves to the conditions to some extent by producing secondary roots as substitutes for injured primary roots, and by increasing the ventilating system through the development of intercellular spaces in the primary tissues. When the plants reached the heading stage, the ventilation system became blocked, resulting in the death of all roots. Plants flooded at the heading stage were not able to adapt themselves and died soon after the treatment began. Both *P. pratensis* and *T. hybridum* adapted themselves well to flooded conditions. Resistance to excess moisture appeared to be largely conditional on the development of an effective ventilation system.—From author's summary.

733 GIFFORD, E. M. Jr. **Some anatomical and cytological responses of barley to maleic hydrazide.** *Amer. J. Bot.* 1956, **43,** No. 1, 72–80, bibl. 30, illus. [Univ. Calif., Davis]

The results of the investigation indicate that barley reacts to treatment with 2% maleic hydrazide with a general inhibition of mitosis, enlargement of certain cells and extensive changes in all vascular tissues which were undergoing differentiation at the time of treatment. The responses are comparable with those of other plants already investigated.—D.B.

MAIZE

734 GRILLOT, M. L'amélioration du maïs et le perfectionnement de sa culture au Maroc. [**The improvement of maize and the perfecting of its cultivation in Morocco.**] *C.R. Acad. Agric. Fr.* 1956, **42,** No. 2, 85–94, bibl. 6.

The results of irrigation, fertilizer and seed-rate trials, carried out between 1952–5 in French Morocco, are discussed. The value of frequent irrigation is stressed. Plant density, provided that a minimum of 15–20 thousand plants per ha. is attained, does not appear to be of prime cultural importance for irrigated hybrid maize in Morocco. —M.P.

735 GRILLOT, M. L'importance culturale des maïs hybrides au Maroc et les conditions de son accroissement. [**The cultural importance of maize hybrids to Morocco and conditions for their increase.**] *C.R. Acad. Agric. Fr.* 1956, **42,** No. 1, 42–7, bibl. 5.

736 STEELE, W. G. and others. **Maize growing on the Atherton Tableland.** *Qd agric. J.* 1955, **81,** Pt. 2, 63–78, illus.

After notes on the climate and soil of the region, advice is given on suitable rotations, land preparation, maize varieties, cultivation and harvesting, based on experience gained from trials in recent years. The Atherton Dent and Durum maize varieties continue to maintain their superiority over Queensland and Grafton hybrids.—M.P.

737 NORMAN, R. J. **Maize investigations at the Ayr Regional Experiment Station.** *Qd agric. J.* 1955, **81,** Pt. 5, 249–54, illus.

From the results of maize trials begun in 1950, recommendations are made for the growing of maize in the Lower Burdekin area of Queensland. The report of the trials includes information on sowing date, irrigation, fertilizer requirements, and suitable hybrids for this district.—M.P.

738 BALJURA, V. I. [**Maize growing in the non-chernozem belt.**] [Russian] *Agrobiologija* (*Agrobiology*) 1955, No. 2, 17–32. [Inst. Grain Husbandry, Non-chernozem Belt]

739 AVAKJAN, A. A. [**Experiment on cultivating maize in the Moscow area.**] [Russian] *Agrobiologija* (*Agrobiology*) 1955, No. 2, 33–41, illus. [Gorky-Lenin Exp. Base, All-Union Acad. Agric. Sci.]

The work of the above Base has been concerned since 1949 with the study of early-, medium-, and late-ripening types of maize for the Moscow area. The use of the square-pocket method of sowing and the application of organic fertilizer, together with superphosphate and lime, have been tested. It is concluded that early- and medium-ripening types can be grown successfully for seed in the Moscow Province but that late-ripening types require treatment to accelerate their phasic development (seedlings cultured in a 10-hr. day). The merits of the variety Skorospelka No. 1 from North Osetin for Moscow conditions are recorded.—M.H.

740 GENTER, C. F. and others. **Effects of location, hybrid, fertilizer, and rate of planting on the oil and protein contents of corn grain.** *Agron. J.* 1956, **48,** No. 2, 63-7, bibl. 16. [Agron. Dep., Virginia Agric. Exp. Sta., Blacksburg, Va]

With 7 maize hybrids at various locations in Virginia, the hybrid nature of the plants was more important than the growing conditions as a source of variation in oil content ; the reverse was true in the case of protein content. With 3 levels of N, P, and K, and at 10,000 and 16,000 plants per acre, the location, sowing rate, and N level all significantly affected protein content. Protein content was significantly higher under drought conditions than under good growing conditions. Highest protein yields occurred with the higher plant stand and heaviest N application. None of

the factors had any appreciable effect on oil content.—From author's synopsis.

741 POPOW, G. and CAPUTA, J. Anbauversuche mit Maishybriden verschiedener Provenienz. [**Cultivation trials with maize hybrids from different sources.**] *Mitt. schweiz. Landw.* 1956, **4,** No. 1, 13–16. [Eidg. Landw. Versuchsanst., Zürich-Oerlikon (G.P.) and Lausanne (J.C.)]

Reliable seed of American hybrids, produced in Switzerland, is on the market. The late-ripening Ohio M34 can be grown in Tessin as grain maize ; north of the Alps it is grown for silage by sowing in May and for green fodder by sowing up to mid-July. The early-ripening varieties Wisconsin 255 and 270 and Orla 266 are sown from late April to early May for grain and from end of May to mid-June for silage ; if sown early in May and harvested July/August they can be used as green fodder. [See also Abs. 742.]—D.B.

742 CAPUTA, J. and POPOW, G. Essais culturaux de semences de maïs hybrides de différentes provenances. [**Cultivation trials with seed of maize hybrids from different sources.**] *Rev. rom. Agric.* 1956, **12,** No. 1, 1–2, illus. [Sta. Féd. Essais Agric., Lausanne (J.C.) and Zürich-Oerlikon (G.P.)]

This is the French version of Abs. 741.—D.B.

743 GOSI, L. Il mais della varietà colturale " Precoce di Bagnolo ". [**The maize variety Early Bagnolo.**] *Genet. agr.* 1955, **5,** No. 1–2, 1–43, bibl. 28.

The information given includes a description, the characteristics and behaviour of this variety in different environments. Early Bagnolo is a heterogeneous population grown in a limited area in Florence Province from where it originated. It is considered of interest for breeding hybrids suitable for the arid regions of central and southern Italy.—E.B.O.

744 STEAD, B. and SCHWEPPENHAUSER, M. A. **Progress in hybrid maize-seed production. In the Highveld region [of S. Africa] 1954-55.** *Fmg in S. Afr.* 1956, **31,** No. 358, 31–3.

The yields of 36 maize hybrids and varieties in trials at 8 different localities are tabulated. Particular mention is made of the characteristics and performance of the more promising hybrids. With very few exceptions, all the varieties were outyielded by the hybrids. [See also *Fld Crop Abstr.* 8 : 836.]—M.P.

745 HARPER, J. L. **Studies in seed and seedling mortality. 5. Direct and indirect influences of low temperatures on the mortality of maize.** *New Phytol.* 1956, **55,** No. 1, 35–44, bibl. 19, illus. [Dep. Agric., Univ. Oxford]

[See also *Fld Crop Abstr.* 8 : 1231.] Maize grains—variety White Horsetooth—were sown in fibre pots in a wet soil. After being kept for 0, 1, 2, 4 or 6 days at 20°C., the pots were exposed for 2 or 10 days to temperatures of −10, −5, 0, 5, 12, 14 or 20°C. For each of the treatments half the grains were treated with a commercial seed dressing containing tetramethyl thiuram disulphide. After treatment at the various temperatures (−10 to + 20°C.) all the pots were finally transferred to 20°C. and the mortality resulting from the combination of treatments was determined. The extent of mortality was considered to be largely controlled by two factors—frost damage and pathogenic activity. The differences in mortality between grains treated and untreated with fungicide are held to give a measure, possibly an under-estimate, of the extent of pathogenic damage. Temperatures of −10 and −5°C. were lethal to grains which had received pre-treatment at 20°C., but grains not receiving this pre-treatment were not all killed. In this temperature range the time of exposure seemed to be of greater significance than the temperature. For grains without pre-treatment, exposure to 0°C. was more lethal than −5 or −10°C. When the grains are first kept at 20°C., the mortality is reduced as the treatment period is extended to 4 and 6 days. Pathogenic damage is important at 0°C. and the extent of the damage increases with the length of the pre-treatment period. Pathogenic activity reaches a peak at 5°C. and again liability to attack increases up to a pre-treatment period of 4 days. The pathogenic activity falls from a high level at 5°C. to a lower value at 12°C. There is a suggestion of an increased mortality following 0, 1 and 2 days' pre-treatment, but an increased resistance develops after 4 days' pre-germination. These results are interpreted in terms of an interaction of true frost damage and pathogenic damage, both factors being operative at 0°C.—From author's summary.

746 HOOKER, A. L. **Additional seed factors affecting stands of corn in cold soils.** *Agron. J.* 1955, **47,** No. 12, 582–5, bibl. 7. [Fld Crops Res. Br., Madison, Wisconsin]

The effects of seasonal conditions of temperature and moisture, date of sowing, level of soil nitrogen and the plant population on the predisposition of maize seed to infection by *Pythium debaryanum* and other soil fungi at low temperatures were studied. Seed produced in 1949 under warm temperatures and ample soil moisture during June, July and August followed by a generally cool but dry September and October produced better stands than that produced in 1951 under generally cool and dry conditions, or in 1950 under cool and wet conditions. Delayed sowing resulted in seed with an

increased susceptibility to soil fungi at low temperatures. No measurable differences in resistance to *P. debaryanum* at 10°C. were detected among seed lots of the same genotype produced at 3 levels of soil nitrogen or at 3 levels of plant population. —From author's summary.

747 GOULD, G. E. **Studies on germination of seed corn treated to control soil insects.** *Sta. Bull. 624. Ind. agric. Exp. Sta.* 1955, pp. 12, illus.

The results are presented of field and greenhouse trials to determine the effect on germination and seedling growth of maize treated with a number of insecticides, including Lindane, Aldrin, Dieldrin, DDT, BHC, Chlordane, Heptachlor, Lindane + Captan, and Lindane + Thiram. Only Lindane and BHC resulted in reduced seed germination and growth distortion in seedlings. At rates of 2 oz. actual Lindane per 100 lb. seed, no deleterious effects were noted in the field. Lindane had no apparent effect on the intact seed, but affected seedling growth as soon as germination began.—P.J.B.

748 THRONEBERRY, G. O. and SMITH, F. G. **Relation of respiratory and enzymatic activity to corn seed viability.** *Pl. Physiol.* 1955, **30,** No. 4, 337–43, bibl. 19, illus. [Iowa State Coll., Ames]

Changes in respiratory capacity and in the activity of malic and alcohol dehydrogenase and cytochrome oxidase of maize embryos were measured during the early stages of germination. These metabolic indices at the 18–hour stage were compared with the germination percentage, tetrazolium test, vigor rating, and cold test of 31 lots of maize of varying viability. Loss of viability appeared to be closely associated with respiratory failure in most seeds. Malic dehydrogenase activity was more closely correlated with germination percentage and respiratory capacity than that of the other 2 enzymes, although considerable malic activity was retained in non-viable seeds. It is doubtful whether inactivation of these 3 enzymes was a major cause of loss of viability, but it appeared likely that dehydrogenase activity was more closely correlated with tetrazolium reduction than with germination percentage. Variations in respiratory metabolism did not explain the differences between germination percentage and cold test or vigor rating.—Authors' summary.

749 TEAS, H. J. and others. **Roles of embryo and endosperm in determining niacin content of starchy and sugary maize endosperms.** *Pl. Physiol.* 1955, **30,** No. 4, 334–7, bibl. 11. [Calif. Inst. Technol., Pasadena ; and Univ. Calif. Citrus Exp. Sta., Riverside, California]

This is a study of the relationship between genetic constitution and niacin content of maize kernels.—D.B.

750 HATTINGH, I. D. **Weed control in maize and kaffircorn with 2,4-D and MCP.** *Fmg in S. Afr.* 1955, **30,** No. 357, 503–6, illus.

The recommendations for pre-emergence spraying of maize in South Africa are : on light soils, 2–3 lb. of pure 2,4–D or MCPA in 40–45 gal. of water per morgen [1 morgen = 2·116 ac.], 4–5 days after sowing ; on heavy soils 2·5–4 lb. are required ; for kaffircorn 2 lb. a.e. of the amine salts of the herbicides in 40 gal. of water per morgen. For post-emergence spraying of maize 1–1·5 lb. of the acid should be applied in 25 gal. of water per morgen, and for kaffircorn 1–5 lb. a.e. of the amine salt in 25 gal. per morgen.—M.P.

751 MCKEE, J. G. **Weed control in maize crops in Gisborne district.** *Proc. 8th N.Z. Weed Contr. Conf.* 1955, 69–73.

The importance of the maize crop in New Zealand is not great, but on the Poverty Bay flats around Gisborne and on one or two of the adjacent river valleys maize is a dependable cash crop. For grain the crop is sown in 30–36 in. rows in October (late), November, and December, and is harvested from late April onwards. Yields up to 120 bu. per ac. are possible, the average being approx. 100. Maize for greenfeed is broadcast or drilled in 14 in. rows and fed off during summer at any time after reaching fence height. This paper is the story of the development of weed control in maize crops in the Gisborne district, and is simply the summary of observations.—From author's introduction.

752 ROBINSON, R. G. and DUNHAM, R. S. **Spray placement in corn after layby.** *Agron. J.* 1956, **48,** No. 1, 35–7, illus. [Agron. and Plant Genet. Dep., Minnesota Univ., St. Paul, Minn.]

To prevent the production of weed seeds in maize crops during August and September, 4 plant coverages with each of 4 herbicides were compared : (1) unsprayed, (2) lower 6 in. of maize plant sprayed, (3) lower 12 in. and (4) entire plant sprayed. The actual rates per acre were 3, 8·8, 3, and 6 lb., respectively, of 2,4–D, TCA, CMU and Endothal. Overall coverage of the maize plant soon after layby was very injurious, regardless of herbicide used. Coverage of the lower 6 in. with TCA, CMU or Endothal was not harmful. 2,4–D resulted in serious maize injury even when only the lower 6 in. were sprayed. Overall coverage of maize with 2,4–D or TCA just after ear appearance was injurious but coverage of only the lower 12 in. was not harmful.—From authors' summary.

753 COX, H. C. and others. **Granulated in-**

secticides for European corn borer control. *J. econ. Ent.* 1956, **49,** No. 1, 113–19, bibl. 4, illus. [Iowa Agric. Exp. Sta., Ames]

Results from trials, in which granulated formulations of insecticides were tested for control of the European corn borer (*Pyrausta nubilalis*) on maize, indicated that they were as effective as the emulsion sprays, and possibly more so. Up to 200 times more residue was found on the leaves of sprayed plants than on those treated with granules.—From authors' summary.

754 LEIDERMAN, L. and SAUER, H. F. G. Resultados preliminares da ação de inseticidas orgânicos no combate a *Heliothis obsoleta* (Fabr., 1793) em espigas de milho. [**Preliminary results from trials to control the corn earworm (*Heliothis obsoleta*) in maize ears by treatment with organic insecticides.**] *Arq. Inst. biol.* 1952–4, **21,** 101–10, bibl. 28, English summary. [Inst. Biol., São Paulo, Brazil] [Received Feb., 1956]

The injection of 0·5 c.c. of 1% DDT, in mineral-oil emulsion, into the maize silks, or spraying with 0·75% DDT, in a 10% white mineral-oil emulsion, were effective treatments.—From authors' summary.

755 TAMM, E. and FUNKE, H. Pflanzenklimatische Temperaturmessungen in einem Mais-Bestand. Ein Beitrag zur Beurteilung des Wachstumsfaktors Lufttemperatur. [**Temperature readings within the plant climate of a maize stand. A contribution towards evaluating air temperature as a growth factor.**] *Z. Acker- u. Pflbau* 1955, **100,** No. 2, 199-210, illus. [Inst. Acker- u. Pflbau, Techn. Univ., Berlin]

756 FRANK, Sylvia and KENNEY, A. L. **Chlorophyll and carotenoid destruction in the absence of light in seedlings of *Zea mays* L.** *Pl. Physiol.* 1955, **30,** No. 5, 413–18, bibl. 10, illus. [Washington State Coll., New York Univ., New York 3]

One-week-old maize seedlings containing known amounts of chlorophyll and carotenoids were placed in the dark, and the time course of the destruction of the pigments followed. Both chlorophyll and carotenoids were destroyed rather rapidly at 27°C. in the dark. All the chlorophyll disappeared completely after 120 hr. in the dark, while the carotenoids fell to 40% of their original value. It was found that, even though the initial pigment concentration varied as much as 150–fold, the time required for the destruction of a given percentage of pigment was independent of the initial concentration. This suggests that the light-independent pigment destruction follows the kinetics of a first-order reaction. Adding sucrose to the environment of the seedlings when placed in the dark effectively protected for a time against depletion of both chlorophyll and carotenoids. Concentrations of 3% sucrose protected the carotenoids completely from destruction in the dark, whereas the chlorophyll concentration decreased 30% in 3% sucrose as compared with 72% destruction in the absence of sucrose. The protective effect of exogenous sucrose on pigment destruction seemed to be to delay the onset of destruction rather than to prevent it from occurring. —Authors' summary.

757 REID, P. H. and YORK, E. T. **The relative growth and potassium absorption by four crops under intensive culture in a limited volume of soil.** *Proc. Soil Sci. Soc. Amer.* 1955, **19,** No. 4, 481–3, bibl. 10. [Agron. Dep., North Carolina Agric. Exp. Sta.]

Two successive crops of groundnuts, soyabeans, maize and cotton were grown in small volumes of Ruston fine sandy loam. One series was fertilized and another unfertilized with respect to K. K-deficiency symptoms appeared first and were most severe on maize, followed by cotton, soyabeans and groundnuts in that order. All 4 crops responded in dry-matter production to the application of K. In the second crop, the dry matter produced by the unfertilized groundnuts, soyabeans, cotton and maize was 69%, 85%, 45% and 20%, respectively, of the plants fertilized with K. —From authors' summary.

758 FOY, C. D. **Magnesium absorption mechanisms in corn [maize].** *Diss. Abstr.* 1955, **15,** No. 11, 1963. [Purdue Univ., Lafayette, Indiana]

759 NYASALAND FARMER AND FORESTER. **Maize investigations, 1954-55.** *Nyasald Fmr For.* 1955, **3,** No. 1, 33–5.

Time-of-sowing trial, p. 34. The yield of maize dropped to 75% when sowing was delayed by 2 weeks, and to 50% when delayed by 4 weeks, in comparison with the early crop, sown on 16 November. Nitrogen gave the biggest responses with the earliest sowing, about 1000 lb. grain for each 150 lb. sulphate of ammonia added, up to 300 lb. per acre. The increase in yield was only 500 lb. grain per 150 lb. fertilizer when sowing was delayed until mid-December.—P.M.G.

760 van GARDEREN, J. **Fertilizer experiments with maize in South Africa.** [Abstract] *Proc. 2nd Inter-Afr. Soils Conf. Leopoldville* 1954, 815–22, bibl. 4, illus.

761 SIVIK, F. P. and KULASH, W. M. **Treated cloth bags to control the rice weevil in corn.**

J. econ. Ent. 1956, **49,** No. 1, 64–5, bibl. 5. [North Carolina Agric. Exp. Sta., Raleigh]

Aldrin, BHC, Chlordane, Dieldrin, Endrin, Heptachlor, Isodrin, Lindane, Malathion, Parathion and Strobane at 1% dilution, were each sprayed on the inside of heavy cotton twill bags, 18 in. × 7·5 in., at the rate of 10 ml. per bag. After drying, the bags were filled with untreated, shelled maize in which rice weevils [*Sitophilus oryzae*] were present. Two dusts, Ryania and a pyrethrins-piperonyl butoxide combination, were mixed with maize at the rate of 10 g. per 10 lb. of shelled maize prior to storage in untreated bags. After 6 months only the pyrethrins-piperonyl butoxide combination and the Strobane treatments had any live weevils. In the Strobane-treated bags and in the untreated control the number of weevils had increased considerably.—E.B.O.

SWEET-CORN

762 Blanchard, R. A. and others. **Insecticides in mineral oil emulsions for control of the corn earworm** [*Heliothis armigera*] **and fall armyworm** [*Laphygma frugiperda*] **in sweet-corn.** *J. econ. Ent.* 1955, **48,** No. 6, 714–18, bibl. 16. [Ent. Res. Br., Agric. Res. Serv., U.S. Dep. Agric.]

SORGHUM AND MILLET

763 Niqueux, M. Les sorghos cultivés dans le territoire du Tchad. Leur amélioration. [**The sorghum varieties grown in Chad. Their improvement.**] *Bull. agron. 12. Fr. d'out. mer* 1955, 198–202, English summary.

A great number of sorghum varieties are grown in Chad, where this cereal provides the staple food. These varieties are grouped into 4 types : (a) Early varieties, belonging to *Sorghum caudatum* ; sown at the beginning of the rainy period and harvested 3 months later. They are generally grown around the native huts ; their grain is easily attacked by storage pests and is of low food value. (b) Winter varieties, which mature from November to January and are grown on a large scale on non-flooded land. This group is divided into (1) medium-cycle varieties, which have a vegetative cycle of about 4·5 months, belonging mainly to *S. caudatum* and generally used for brewing, and (2) long-cycle varieties, which have a vegetative cycle of up to 6 months, belonging mainly to *S. elegans* (also to *S. caudatum* and other less important species). They have a grain which stores well and is of a high food value. (c) Varieties, belonging mainly to *S. durra*, which are sown in nurseries on high ground, are transplanted onto low-lying clay soils after the flood water has subsided and are harvested from January to March. (d) Sweet-stalked varieties belonging mainly to *S. mellitum*. These are grown on small patches around huts or in a few rows amongst other sorghums. An account is given of work with sorghum at Ba-Illi Experimental Station.—E.B.O.

764† Wilson Jones, K. **Further experiments on witchweed control. 2. The existence of physiological strains of *Striga hermontheca*.** *Emp. J. exp. Agric.* 1955, **23,** No. 91/2, 206–13, bibl. 9, illus. [Res. Div., Sudan Minist. Agric.]

Sorghum millets are usually heavily attacked by *Striga hermonthica* on the clay soils of the Sudan where *Pennisetum* millets are practically immune. The reverse is true on the sandy soils, where *Pennisetum* is heavily, and *Sorghum* only lightly, attacked. Field and pot experiments showed the different behaviour of *Striga hermonthica* on these two soils to be due to the existence of 2 strains of the parasite.—From author's summary.

765 Leukel, R. W. and others. **Sorghum seed-treatment tests in 1955.** *Pl. Dis. Reptr* 1956, **40,** No. 2, 138–40. [Fld Crops Res. Br., Agric. Res. Serv., U.S. Dep. Agric.]

Of a number of mercurial and non-mercurial fungicides tested for the control of covered kernel smut of sorghum seed [*Sphacelotheca sorghi*] Phygon slurry gave markedly better results than the other materials when used for treating seed with persistent glumes.—P.J.B.

766 Ministère de la France d'Outre-Mer. Comptes rendus de la Conférence arachide-mil, Bambey (Sénégal), 5–13 Septembre 1954. [**Proceedings of the Conference on Groundnuts and Millet. Bambey, Senegal, 5-13 September, 1954.**] *Bull. agron. 12. Fr. d'out. mer* 1955, pp. 222, bibl.

[See also Abs. 825].

Among the papers presented at this Conference, attended by French, British and Portuguese delegates, were the following :

1. Groundnuts, millet (*Pennisetum* spp.) and sorghum in French Guinea. By M. Bayle, pp. 155–60. The cultivation of millet and sorghum is important in Upper-Guinea only, especially in the Circle of Siguiri. Information is given on crop areas, production and work carried out at the agricultural station at Kankan.

2. Work on millets and sorghums at the agricultural station at Guétalé, northern French Cameroons. By M. Barbe, pp. 192–7. An account is given of trials carried out before 1954. In 1953 the improved millet and sorghum varieties (which are mentioned) increased yields by up to 30% over yields from non-improved varieties. Details are given of trials in progress in 1954.

3. Sorghum varieties grown in Chad and their improvement. By M. Niqueux, pp. 198–202. [See Abs. 763.]—E.B.O.

RICE

767 Marie, R. Contribution à l'étude du riz en France. [**A contribution to the study of rice in France.**] *Ann. Inst. nat. Rech. agron. Paris, Sér. B. Ann. Amélior. Pl.* 1955, **5,** No. 3, 463–535, bibl. 40, illus. [Cent. Rech. Agron. Midi, École Nat. Agric., Montpellier]

Though the cultivation of rice in Camargue has been known since the 16th century, it is only since 1942 that the crop has been of any importance. A general account is given of rice cultivation in the south of France. This account consists of a discussion of : (1) the environmental factors of soil, water and climate, each of which is said to be of equal importance ; (2) the cultivation technique, e.g. sowing on the surface and below the surface of the water, transplanting, control of weeds and mechanization ; (3) notes on the principal varieties cultivated in the South of France. To provide good seed and to produce varieties adapted to the region, an experiment station was opened at Merle in 1948. An account is given of the rice-breeding programme, using varieties from many parts of the world.—D.B.

768 Khan, S. and Shafi, M. **Effect of spacing and varying the number of seedlings per hill on yield of paddy in the Punjab (Pak.).** *Pakist. J. sci. Res.* 1956, **8,** No. 1, 28–35, bibl. 5. [Punjab Agric. Coll., Lyallpur and Rice Farm, Kala Shah Kaku, Distt. Sheikhupura]

The effects of 3 × 3 in., 6 × 6 in., 9 × 9 in. and 12 × 12 in. spacing between plants and of 1, 2 and 3 seedlings per hill on the number of tillers per plant, maturity, grain weight, grain and straw yields of transplanted rice were studied. Three experiments were laid out in randomized blocks. In the first, the 4 different spacings were compared, using a single seedling per hill. In the second experiment, a single seedling per hill at 6, 9 and 12 in. spacing was compared with 2 seedlings per hill at 9 and 12 in. and 3 seedlings per hill at 12 in. spacing. The third was a varietal-cum-spacing experiment. The following conclusions were drawn: (1) The 12 in. spacing yielded significantly less than the 3, 6 and 9 in. spacings which showed no significant differences among themselves. (2) There was on the whole a direct increase in straw yield with the increase in the number of plants per unit area. (3) There was a more or less significant increase in the percentage of straw to grain as the spacing decreased, and this ratio also depended on yearly climatic fluctuations. (4) Grain weight and number of tillers per plant increased significantly as the spacings increased. (5) Maturity was delayed by wider spacings. (6) The increase in the number of seedlings per hill did not influence yield appreciably. (7) The number of tillers per hill increased significantly, although the number of tillers per seedling decreased, as the number of seedlings per hill increased. (8) Early varieties such as 278 Sathra and 349 Jhona did not respond to different spacings. The late-ripening variety 370 Basmati gave its highest yield at a 6 in. spacing.—P.M.G.

769 Watabe, T. and others. **Fundamental studies on the ridge-culture of rice plants.** [Japanese] *Proc. Crop Sci., Japan* 1955, **23,** No. 3, 163–6, English summary. [Agric. Fac., Univ. Kyoto, Japan]

Plant heights, tiller numbers and N-contents of leaf blades were higher in plants grown on ridges than on the level, during the whole of the vegetative period ; this trend was reversed during the reproductive growth phase. Root dry-weights and lengths were higher for ridge-grown plants than those grown on the level ; also, heading took place slightly earlier on the ridge-grown plants. Plants grown on the level produced higher grain weights per plant and greater numbers of grains per ear than those grown on the ridge. Nutritive deficiencies appeared in the soil where ridges were used and, despite a favourable soil nutritive status during the vegetative phases, plants grown on ridges produced 11–23% lower grain yields than those grown on the level.—From authors' summary.

770 Szokolay, G. **The Swaziland Irrigation Scheme. 3. Ratooning of rice on the Swaziland Irrigation Scheme.** *World Crops* 1956, **8,** No. 2, 71–3, illus.

An alternative to the ratooning system, which gives 2 rice crops per year, was investigated. In this, 2 good crops were obtained in 2 years from only one land preparation and planting operation. The main crop was planted in November, harvested in March, and the stubble left through the winter without irrigation. In the spring (September) the stubbles were irrigated and the subsequent ratoon crop harvested in January. In small-scale trials, yields from these ' spring ratoons ' were not much less than from their preceding planted crops. —M.P.

771 Guernier, M. La culture du riz en sec en Casamance (Sud-Sénégal). [**Rice cultivation without irrigation in Casamance (South Senegal).**] *Riz et Rizicult.* 1955, **1,** No. 4, 131–3.

The Compagnie Générale des Oléagineux Tropicaux, founded in 1948 with the object of developing oil

crops in the French Union, has started the mechanized cultivation of groundnuts in Casamance. It was decided to grow them in a rotation. Millet or sorghum proved successful for green manure. Trials to introduce non-irrigated rice started in 1952, the rotation adopted being : green manure/groundnuts/rice/groundnuts. These crops are grown on flat land, or on lands having a slope of less than 1·5%. The rainfall of the region is about 1200–1500 mm. distributed over 4 months during which there are dry periods of up to 6–8 days. Results are given from trials with rice carried out at the research station in 1954. The best varieties were E 425 and R 52, closely followed by R 65. E 425 yielded 1875, 2095 and 2112 kg. per ha.,with no manuring, and with the application of N 20 and NPK fertilizers, respectively. The seed should be sown at the beginning of the wet season when possible, at the rate of about 50–55 kg. per ha., in rows 40 cm. apart. The best manuring formulae appeared to be N 20. P 20. K 5 (100 kg. of ammonium sulphate, 50 kg. of dicalcium [phosphate] and 10 kg. of potassium chloride) and N 20. P 20. K 20. In trials on a large scale, the varieties 902 and 415 yielded an average of 1800 kg. per ha. In 1955, 300 ha. were sown with non-irrigated rice.—E.B.O.

772 Du Pasquier, R. Situation de la riziculture en Corée du Sud. [**The rice-growing situation in South Korea.**] *Riz et Rizicult.* 1955, **1,** No. 4, 145-52, illus.

773 Degras, M. Étude de variétés en vue de leur amélioration pour la riziculture fluviale Ouest-Africaine. [**A study of rice varieties with a view to their improvement for river rice cultivation in West Africa.**] *Riz et Rizicult.* 1955, **1,** No. 4, 135–40, bibl. 1. [Cent. Rizicole de Kankan, French Guinea]

This work is concerned with the system of growing rice in level strips of single varieties on sloping ground, using the flood water from rivers, as practised by the natives of West Africa [see *Fld Crop Abstr.* 3 : 856]. In the rice-fields of the upper valley of the Niger, and of its tributaries, the variation in the flood-water level is often more than 2 m. An account is given of preliminary studies carried out with more than 200 varieties belonging to *Oryza sativa* and *O. glaberrima*. Results showed : the importance of the ratio between the length of the coleoptile and that of the mesocotyl for determining the degree of suitability of a variety to flood-land cultivation ; the influence of water on the developmental stages of rice ; and the possibility of protecting the crops from the effect of a sudden rise of the water by previous artificial flooding.—E.B.O.

774 Larter, L. N. H. **Rice variety trials in Malaya, 1950-54.** *Sci. Ser. 26. Dep. Agric. Malaya* 1955, pp. 60.

Regional trials with Reyong 6 in Malacca and Seri Raja in Perak have shown these varieties to be considerably higher yielding than varieties commonly grown in these areas.—From author's summary of recommendations.

775 Baba, I. **Varietal differences of the rice plant in relation to the resisting capacity to root-rot disease, induced by hydrogen sulphide, and a convenient method to test them.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 167–8, English summary. [Nat. Inst. Agric. Sci., Tokyo]

Considerable differences were observed between rice plants in respect of the degree of root rot produced by the evolution of H_2S in paddy soils. Varieties having a high degree of adaptability to " akiochi " conditions showed the highest degree of resistance to H_2S injury.—From author's summary.

776 Enomoto, N. and others. **On the artificial germination of pollen in rice plants. (2). Pollen-tube growth and an example of its varietal difference.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 162, English summary. [Agric. Fac., Univ. Kyoto, Japan]

Studies were made on the growth of rice pollen tubes and differences between pollen-tube growth in Japanese and foreign varieties. In all tests, 50–100% of the pollen germinated. Germination began immediately after the pollen was placed on the germination media (5% potato-starch paste, containing 15% sucrose). Initial growth of pollen tubes lasted for 10–20 min. and ceased after 20–30 min. The final length of pollen tubes ranged from 50–110μ. The growth of pollen tubes of foreign varieties continued for 5–10 min. longer than that of Japanese varieties. Foreign varieties produced pollen tubes ranging from 70–110μ, compared with 50–80μ for Japanese varieties.—From authors' summary.

777 Ohira, K. **The absorption and translocation of phosphorus and iron in rice plants.** *Tôhoku J. agric. Res.* 1955, **5,** No. 4, 345–53, bibl. 8. [Agric. Fac., Univ. Tôhoku, Sendai, Japan]

778 Fujiwara, A. and Iida, S. **Biochemical and nutritional studies on potassium. 1. Effects of potassium on the respiration of higher plants.** *Tôhoku J. agric. Res.* 1955, **6,** No. 1, 57–65, bibl. 28. [Agric. Fac., Univ. Tôhoku, Sendai, Japan]

Studies are reported on the effect of N + K, N + K + glucose, K + Na and K + Fe on the respira-

tion of rice and barley seedlings grown in nutrient solutions.—P.J.B.

779 FUJIWARA, A. and IIDA, S. **Biochemical and nutritional studies on potassium. 2. Potassium in relation to the carbohydrate metabolism of higher plant.** *Tôhoku J. agric. Res.* 1955, **6,** No. 1, 67–74, bibl. 7. [Agric. Fac., Univ. Tôhoku, Sendai, Japan]

Studies are reported on the effect of K supply on the yield, K- and carbohydrate-content and respiration intensity of rice and barley plants grown in nutrient solutions. There was evidence of an increased capacity of plants grown in conditions of high K supply to withstand unfavourable environmental conditions.—P.J.B.

780 BABA, I. **Studies on the nutrition of the rice plant with special reference to nitrogen and silica. 1. Translocation of absorbed silica in plants and its accumulation in the epidermal cells of leaf blades in relation to transpiration.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **24,** No. 1, 29–33, English summary. [Nat. Inst. Agric. Sci., Tokyo]

781 MISRA, G. and SAMANTARAI, B. **Effects of various levels of nitrogen on the vegetative growth and ear emergence of rice plants.** *J. Indian bot. Soc.* 1955, **34,** No. 4, 451–4, bibl. 13. [Bot. Dep., Ravenshaw Coll., Cuttack, India]

The results are given of sand-culture studies on the vegetative growth and ear emergence of rice receiving different levels of N supply applied successively in 3 equal amounts on 23 Sept., 16 Oct. and 28 Nov., following sowing on 25 July. Amounts of N as ammonium nitrate were 3, 1, 0·33, 0·11 and 0·037 g. per pot. The number of days to ear emergence was little affected by the treatments. The full rate of N treatment resulted in marked increases in tillering, leaf production and stem elongation, compared with where N supplies were restricted. These differences became very marked only after the third N application.—P.J.B.

782 ARASHI, K. and EGUCHI, H. **Studies on the growth of culm in paddy and variation of starch content in internodes between normal and "akiochi" plants.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 169–73, English summary. [Shimane Agric. Coll., Japan]

Total culm weights in paddy rice increased to an average of 70 g. at about 12 days after heading. Thereafter they decreased to just over 50 g. at about 37 days after heading and then increased again to nearly 60 g. at maturity. Seasonal changes in the starch content of the culm internodes followed the same trend as total culm weights. The period of decline from maximum starch content was associated with the rapid translocation of carbohydrate to the panicles and the time of subsequent minimum starch content with the stage at which the grain had almost reached its full weight. The main cause of changes of internode weight with growth was considered to be due to changes in starch content. Starch content, in general, was highest in the lower internodes. The uppermost (16th) internode had very low starch contents at all growth stages. In "akiochi" plants, the trend of starch content with growth stage was similar to that in normal plants; absolute starch contents were lower, particularly in the lower internodes, but higher in the uppermost internode, than in normal plants. The relatively low starch content in the lower internodes of "akiochi" plants was thought to be due to a lower level of carbon assimilation and earlier translocation of carbohydrates to the panicle, together with relatively poorer translocation of carbohydrates in later growth stages. These factors are thought to cause the imperfect development of grain in "akiochi" plants.—From authors' summary.

783 YAMADA, N. and others. **Photosynthesis of rice plant.** *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 214–22, illus. [Nat. Inst. Agric. Sci., Tokyo]

The results are given of studies on the effect of light intensity and temperature on photosynthesis, and relationships between photosynthesis and respiration.—From authors' summary.

784 TAKEDA, T. and MARUTA, H. **Studies on CO_2 exchange in crop plants. 3. The effect of light intensity and spacing on the photosynthetic rate of rice-seedlings.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **24,** No. 1, 34–40, bibl. 11, English summary. [Agric. Fac., Univ. Tokyo]

Studies were made on the effect of light intensity on the photosynthetic rate of rice seedlings grown in pots in thin, intermediate and thick stands (13, 45 and 89 plants per pot, respectively). At the 4·1–leaf stage, light intensity saturation points for plants grown in thin, intermediate and thick stands were less than 30, 50 and 80 k. lux, respectively. At the 5·2–leaf stage, this value for plants grown in thick stands increased markedly to 100 k. lux, and to a maximum of less than 80 k. lux for plants grown in thin and intermediate stands at the 7·5- to 7·7-leaf stage. It was concluded that in nursery beds under natural conditions, seedlings grown in thick stands do not receive enough light to reach their saturation point, while thinly-sown seedlings are subjected to light intensities up to their saturation point up to the time of transplanting. Under conditions of intermediate plant stands, which are

similar to those used in practice, the saturation point of seedlings is relatively low in early growth stages, but is not reached at late growth stages before transplanting, owing to the progressive thickening of the stand.—From authors' summary.

785 MATSUSHIMA, S. and others. **Crop-scientific studies on the yield-forecast of lowland rice. (Preliminary report.) (12, 13, 15.) Carbon assimilation of rice plant under near-natural conditions.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 192–7, bibl. 33, illus., English summary. [Nat. Inst. Agric. Sci., Tokyo]

A description is given of apparatus for determining the rate of carbon assimilation by whole plants. In experiments with rice plants, carbon assimilation increased up to light intensities of 0·5 cal. per cm.^{2} per min. The light saturation point for rice plants appeared to be about 0·6 cal. per cm.^{2} per min., except at about 17 days after heading, when it began to decline. In experiments on diurnal changes in carbon assimilation, assimilation began at sunrise and reached a maximum at about 8 a.m., and thereafter remained at an approximately constant level until 4 p.m. Measuring light intensity during the growing season of rice was thought to have promise as a means of forecasting rice yields.—From authors' summary.

786 MATSUSHIMA, S. and others. **Crop-scientific studies on the yield-forecast of lowland rice. (Preliminary report.) 25. Carbon assimilation of rice plant under natural conditions and its application to the yield-forecast.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **24,** No. 1, 41–7, bibl. 15, English summary. [Nat. Inst. Agric. Sci., Tokyo]

Observations are made on the results obtained from an improved version of the apparatus described previously [see Abs. 785]. Using data from daily records of light intensity, it was possible to make a reasonably good forecast of rice yields from calculations of carbon assimilation.—From authors' summary.

787 TOGARI, Y. and others. **Studies on CO_2 exchange in crop plants. 1. On the apparatus for continuous measuring of CO_2 exchange in crop plants. 2. Changes in the assimilation and respiration rate associated with the growth of rice plant.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 207–13, bibl. 16, illus., English summary. [Agric. Fac., Univ. Tokyo.]

788 BABA, I. and INADA, K. **On the oxidation-reduction potential of tissue fluid of the rice plant. 2. Redox potential as influenced by light intensity and water temperature. 3. Changes in the redox potential of the leaf by the growing stages of the plant. 4. Varietal differences in redox potential of the leaf.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 187–91, English summary. [Nat. Inst. Agric. Sci., Tokyo]

789 ROY, S. K. and SUBRAMANYAM, K. N. **Photoperiodic responses of some early varieties of rice of Bihar.** *J. Indian bot. Soc.* 1955, **34,** No. 4, 455–8, bibl. 19. [Rice Res. Sta., Sabour, Bihar, India]

A report is given of the response of 25 early-maturing autumn rice varieties to 8-hr. photoperiods. Growth responses varied considerably between varieties, e.g. the varieties Ch 47, Ch 41 and Kolaba showed a decrease in time from sowing to flowering of 26, 19 and 20 days, respectively; Sarguja and Hungarian were day-neutral and showed no response to the short-day treatments; the varieties Backgora, Ch 63 and Ch 4 showed a delay in flowering of 7, 9 and 8 days, respectively, following treatment. On the basis of these results, the varieties could be classified into 3 groups, namely, short-day, day-neutral and long-day.—P.J.B.

790 NAKAYAMA, H. and KIYOSAWA, S. **Effects of high night-temperature upon the growth and heading of rice plants.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 198–9, English summary. [Nat. Inst. Agric. Sci., Tokyo]

Plants of one early and one late rice variety were transplanted into pots and placed in either of two greenhouses, one of which was maintained at normal night temperatures and the other at night temperatures 7°C. higher than those of the first. The treatments continued throughout the life of the plants, or were initiated at the young seedling, elongating, tillering and boot stages and continued for 30 days in each case. Treatment at the young seedling and elongating stages increased the rate of appearance of new leaves but decreased plant height. Treatment when begun at the tillering stage decreased tiller numbers. These effects were noted in both rice types. Ear numbers decreased following treatment, particularly where this began at an early growth stage; also, heading was delayed. Plants subjected to normal night-temperatures and high night-temperatures during their whole life did not differ in times of heading. Plants subjected to high night-temperatures had reduced dry weights, particularly in the case of the early variety. It was concluded that high night-temperatures at the young seedling or tillering stages inhibited plant growth.—From authors' summary.

791 YAMADA, N. and others. **Physiological basis of resistance of rice plants for submersion under water.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 3, 155–61, English summary. [Nat. Inst. Agric. Sci., Tokyo]

The O_2 content of the internal air in submerged rice plants fell to very low levels. Aerobic respiration was reduced and anaerobic respiration increased, accompanied by an increased consumption of hexose sugars and a decreased evolution of energy. Thus, the amount of available carbohydrates in the plants was rapidly exhausted and proteins were subjected to hydrolysis. Low O_2 tensions inhibited hydrolysis of proteins. Bubbling air through the water in which rice plants grew increased hydrolysis, as did exposure of submerged plants to light. Protein hydrolysis resulted in the production of soluble nitrogenous fractions, through the utilization of intermediate substances, such as amino acids, as respiration substrates. The resistance of rice plants to submersion was determined by 3 factors : (a) the amount of available carbohydrate in the plants, (b) speed of consumption of respiration substrate, and (c) O_2 tension. High O_2 tensions entailed a reduced level of carbohydrate consumption and a prolongation of the supply of respiration substrate produced by protein hydrolysis.—From authors' summary.

792 SAHADEVAN, P. C. and KALYANIKUTTY, T. **Effect of indirect manuring on the yield of broadcast rice in Malabar.** *Madras agric. J.* 1955, **42,** No. 12, 537–40, bibl. 2. [Agric. Res. Sta., Pattambi]

An experiment was laid down to determine the residual effect of compost and cattle manure, applied to the transplanted second-crop rice strain PTB 20, on the succeeding broadcast strain PTB 2. Green-leaf compost at the rate of 5000 lb. per ac., cattle manure at the rate of 10 tons per ac., both applied a fortnight before planting, and control plots without manure were the treatments in the second-crop season. For the following broadcast crop, each plot was split into 2 ; the control received no manure, while the other received green manure at the rate of 2000 lb. per ac. and superphosphate at 30 lb. P_2O_5 per ac. 5 days before sowing, followed, about 2 months later, by 150 lb. ammonium sulphate per ac. Data were collected from the 1950 second-crop season to the 1953 first-crop season. Over the 3 second-crop seasons, the green-manured plots averaged a yield of 130% and the cattle-manured plots averaged 125% of the control plot yields. The cattle-manured plots averaged, in the first crop seasons, a yield of 111%, while the green-manured plots averaged only 103% of yields of broadcast PTB 2 control plots. The broadcast control plots following cattle manuring in the second season averaged 122%, while those following green manuring in the second season averaged only 106% of the yields of plots which were controls in both seasons.—P.M.G.

793 ALIM, M. and CEN, J. L. **Manuring spring paddy (Boro), 2.** *Pakist. J. sci. Res.* 1955, **7,** No. 4, 153-9, bibl. 5. [Agric. Res. Sta., Habiganj, Sylhet]

Applications of bulky organic manures (0–120 lb. N per acre, as cowdung, and 0–60 lb. P_2O_5 per acre, as bone meal) did not increase the yield of spring rice on the rich soils of the Habiganj Farm. A quick-acting fertilizer, however, supplying 20 lb. ammoniacal nitrogen per acre, resulted in a significant increase in yield on the same soils, which are maintained by annual deposits of silt and residues of aquatic vegetation. Dressings of more than 20 lb. of ammoniacal nitrogen resulted in increased straw yields at the expense of grain production.—P.M.G.

794 ROCHE, P. and others. Utilisation des engrais verts en rizière dans la région du lac Alaotra (Madagascar). [**Use of green manures in rice-fields in Lake Alaotra region (Madagascar).**] *Riz et Rizicult.* 1955, **1,** No. 4, 141–4, illus.

Soyabean and *Cajanus indicus* are recommended as green manures for increasing rice yields. These legumes are grown as catch crops under irrigation ; their place in the rotation is after rice. They are sown in June and ploughed under in November, while rice occupies the ground from December to May. *Dolichos lablab,* also recommended, is grown during December/November without irrigation on land situated near the rice-field. Its leaves and stems are conveyed to the rice-field and ploughed under before rice is transplanted in December. The considerable increases in rice yields given by this legume applied at the rate of 16 metric tons per ha. are comparable with those obtained from a complete NPK fertilizer applied at the rate of 850 kg. per ha.—E.B.O.

795 TEUNISSON, Dorothea J. **Influence of storage without aeration on the microbial populations of rough rice.** *Cereal Chem.* 1954, **31,** No. 6, 462–74, bibl. 28. [South. Reg. Res. Lab., U.S. Dep. Agric., New Orleans, Louisiana]

The results are given of microbiological studies on rough [unhusked] rice with moisture contents of 14·3, 18–20 and 21·5–32·4% in sealed containers. The results indicated that souring of rice during storage was due to insufficient aeration and that such souring was associated with proliferation of yeasts and the survival of bacteria.—P.J.B.

GENERAL

796 BLACKMAN, C. R. **Spacing and fertilization**

of winter versus spring grain companion crops. *Diss. Abstr.* 1955, **15,** No. 12, 2374–5. [Rutgers Univ., New Brunswick, New Jersey]

In trials during the 1949–50 season, winter wheat and spring barley were sown at row-spacings of 7 or 14 in., in combination with 6 different rates of manurial treatment. Grain and straw yields were highest where the 7 in. row-spacing was used, but growth of undersown forage species was best where the 14 in. row-spacing was used. The manurial treatments had no significant effect. In trials in the 1950–3 seasons, alternate 7 and 14 in. row-spacings were also used. Alternate row-spacings resulted in higher grain- and straw- yields than where 7 or 14 in. spacings were used. Spring top-dressings of 30 lb. N per ac. as sodium nitrate significantly increased grain- and straw- yields, but resulted in a significant decrease in the stands of undersown red clover. From these results, it was concluded that, with winter wheat, alternate 7 and 14 in. row-spacings, combined with spring top-dressings of 30 lb. N per ac. gave the best results, both in terms of cereal yields and growth of undersown forage species. With spring oats, 7 in. row-spacings were recommended.—P.J.B.

797 STRAND, E. Undersøkelser over kornarters og kornsorters vaerresistens. **Studies on weather resistance of small grain species and varieties.** *Forskn. Fors. Landbr.* 1954, **5,** No. 7, 547–78, bibl. 13. [Roy. Agric. Coll., Vollebekk, Norway]

The studies reported were carried out during 1951–3. Data are given of mean temperature, precipitation, wind strength, relative humidity and degree of cloudiness. In studies on respiration losses in grain, dry-matter losses during a 10-day period from the dough stage of maturity averaged 2% for 2-rowed barley, 3·7% for 6-rowed barley, 5·5% for oats and 5·9% for spring wheat. During this period, the moisture content of the grain fell from 40 to 20%. The crops were harvested at 3 stages of grain maturity, namely: (a) the dough stage, (b) when the moisture content of the grain fell to 20%, and (c) at about 30 days after the dough stage was reached. In trials with 21 spring wheat varieties, mean grain yields fell by 7·6% from the 1st to the 2nd harvest stages, and by a further 8·9% from the 2nd to the 3rd. This reduction was smallest for the late varieties. Sprouting in the ear contributed to the yield losses of late-harvested crops. Grain hectolitre weights also showed a progressive fall with delayed harvest and were highly significantly correlated, positively, with yield reductions. Diamant II and Drott showed very small reductions in hectolitre weight with delayed harvest. Late varieties were all resistant to sprouting and gave grain of good seed quality at the second harvest date and even at the 3rd date in some cases. The early varieties Kimmo and Tammi were also very resistant to sprouting. Mean shedding percentages for late, medium early and early varieties were 1·4, 2·2 and 3·9, respectively. With barley, greatest grain losses were caused by stem break at the nodes, or 2–3 cm. below the ear. Of the 2-rowed varieties, Ymer, Herta and Domen were better than the other 2-rowed varieties in this respect, while Freja was the worst. The smooth-awned, 6-rowed, varieties HO2–18, HO2–17 and HO2–73 were nearly as good in this respect as the best 2-rowed varieties. Stem node-break was commonest in 2-rowed varieties and breakage 2 cm. below the ear in 6-rowed varieties. Mean yields of 2-rowed barley were very similar at the 1st and 2nd harvest dates. Yield reductions between the 2nd and 3rd dates averaged 4%. Yield losses with delayed harvest were greater in smooth-awned, 6-rowed varieties than in 2-rowed varieties, partly the result of greater dry-matter losses through respiration in the former. The late, rough-awned, 6-rowed varieties showed greater yield losses with delayed harvest than the smooth-awned varieties, mainly the result of ear breakage, and a tendency to sprout in the ear and their relatively greater respiration losses. Hectolitre weights of 2-rowed varieties dropped an average of 2 kg. between the 1st and 2nd harvest dates and a further 3 kg. between the 2nd and 3rd. Six-rowed barley showed very little reduction in hectolitre weight with delayed harvest. Germination of almost all varieties was maintained well up to the 3rd harvest date. With 2-rowed varieties, Domen, Heimdal and Carlsberg showed most reduction in germination with delayed harvest. With oats most grain losses due to delayed harvest were caused both by shedding and straw breakage. Straw breakage began 3–4 weeks after the dough stage was reached, independently of the weather. There was little difference between varieties in this respect and also in respect to the amount of seed shed. Mean grain yield reductions between the 1st and 2nd harvest dates were 9·6% and between the 2nd and 3rd, 7·1%. A large amount of this yield reduction was due to respiration losses. Bambu, Bambu II and Gullregn II showed a sharp yield reduction with delayed harvest. Hectolitre weights were little affected by delayed harvest. Observations are made on the choice of varieties.—P.J.B.

798 ROSEN, H. R. **Reduced yields, weakened straw and other abnormalities in small grains induced by late freezes in March, 1955, in Arkansas.** *Pl. Dis. Reptr* 1956, **40,** No. 1, 30–2, illus. [Arkansas Agric. Exp. Sta., Fayetteville]

A brief report is given of damage to wheat, barley, rye and winter oats caused by freezing in late March. Temperatures in Arkansas were above normal in early March, 1955, and most varieties

of the above crops had broken their dormancy and were shooting or jointing rapidly when temperatures dropped to 12°F. on 22 March and to 9°F. on 26 March, with temperatures below 32°F. for the three following days. Damage to all crops and plants was severe. Wheat suffered reduced plant stands and reduced tiller numbers. The remaining tillers were so weakened that the grain failed to fill out properly, despite favourable growth conditions after the frosts. The straw was also very much weakened and lodging was severe, even in normally stiff-strawed varieties. In oats, weakness in the stems extended to the rachises of the panicles causing a lax growth habit. A marked increase in the number of primary florets bearing awns was noted in oats.—P.J.B.

799 THORPE, H. C. **Release of new cereals [in Kenya].** *K.I.O. Fortnightly* 1956, No. 403, 2. [Dep. Agric. Kenya]

Notes are given of the cereals released from departmental control for cultivation in Kenya. These are : the wheats 356.A.2. A. to be known as 356.B., 358.AA.5.B., 362.B.1.E.4. ; the barleys Carlsberg and Proctor, and the oats Boone and R.L. 1734.—M.P.

800 THORPE, H. C. **Cereals in Kenya : 1956-57.** *K.I.O. Fortnightly* 1956, No. 404, 3–5.

The wheat crop of the 1955/6 season, when there was a severe stem-rust epidemic, is reviewed. A table shows the varietal characteristics in respect of straw strength, maturity, baking quality and the recommended altitude range of 20 commonly grown wheat varieties. More expanded notes are given of 24 wheat, 7 barley and 5 oat varieties, including those recently released and mentioned in Abs. 799.—M.P.

801 BORNER, H. Die Ausscheidung organischer Verbindungen aus den Samen von Roggen (*Secale cereale* L.), Weizen (*Triticum aestivum* L.) und Gerste (*Hordeum vulgare* L.) während der Quellung. [**The excretion of organic compounds from the seed of rye, wheat and barley during swelling.**] *Naturwissenschaften* 1955, **42,** No. 2, 48, bibl. 5. [Landw. Hochsch., Hohenheim, Baden-Wurttemberg, W. Germany]

These excretions are important because of their effect on other plants and on the microflora in the soil surrounding the seed. In an analysis by the paper chromatography method (details of procedure given) it was established that the excretion from soaked seeds of cereals consisted of 5 amino acids and 2 reducing sugars. Of the sugars, xylose was excreted from barley only. An extract of the ground seeds contained, in the free state, only those amino acids and reducing sugars which were excreted into the soaking medium. The compounds were excreted from living cells after 24 hr. soaking, but when the seeds had first been killed these same compounds were excreted after 96 hr. soaking. The fact that the amino acids and reducing sugars were excreted from dead, soaked seeds, as well as from living seeds, indicates that the process is one of diffusion rather than a vital process.—D.B.

802† PETZOLDT, K. Mähdrusch und Unkraut. [**The combine-harvester and weeds.**] *Landtechnik* 1955, **10,** No. 11, pp. 3, illus. [Inst. Pflanzenschutz, Stuttgart-Hohenheim, Baden-Wurttemburg, W. Germany]

The effect of the combine-harvester on weeds and vice versa is being investigated. Preliminary results indicate that : (1) the presence of weed seeds in chaff is less serious than was at first thought ; (2) the combine-harvester exercises a selective action on the weed flora ; (3) there are indirect effects, such as changes in the subsequent cultivation technique (e.g. from stubble sowing to undersowing), which change the environment for the weed species ; (4) as the cereal crop remains standing longer before being harvested, more weeds shed their seed than is the case in traditional methods of harvesting.—D.B.

803† FEDOROV, A. K. [**Data on the phasic development of winter plants.**] [Russian] *Agrobiologija* (*Agrobiology*) 1955, No. 3, 64–9, bibl. 9. [Inst. Genet. Acad. Sci. USSR]

[See *Fld Crop Abstr.* 8 : 385.] Information is given on the date of completion of the vernalization phase in winter cereals and in perennial herbage plants.—M.H.

804 SUBBA RAO, M.S. and LAL, K. N. **Development of assimilating surface in relation to leaf indices and dry matter accumulation.** *Proc. Indian Acad. Sci.* 1955, **42,** No. 6, 258–82, bibl. 29. [Col. Agric., Banaras Hindu Univ.]

The interrelationship is traced between linear measurements of leaf, leaf-surface expansion, leaf dry weight and plant dry weight of wheat, barley, rice, maize and sugar-cane under different conditions of nutrition in pot cultures and under field conditions. Leaf area was related to leaf length and leaf width in the middle of the blade. For the individual leaf, this relationship is expressed by the equation $\text{Log A} = \text{Log L} + \text{Log B} - \text{Log K}$; and for a population of N leaves on the plant by $\text{Log } \Sigma\text{A} = \text{Log } \Sigma\text{L} + \text{Log } \Sigma\text{B} - \text{Log K} - \text{Log N}$ where A, L, B and K are the area, length, breadth and leaf factor, respectively. The leaf factor K appeared to be an important physiological constant depicting the relationship between $\text{L} \times \text{B/A}$ and was independent of age of plant or size of

leaf. A relationship between linear measurements and leaf dry weight was found and expressed by Log ΣLW = Log ΣL + Log ΣB + Log X − Log K − Log N. The relationship between linear measurement and plant dry weight was Log P_w = Log ΣL + Log ΣB + Log X − Log K − Log Y − Log N where P_w = plant dry weight, L = length, B = breadth, X = factor leaf dry weight/leaf area, Y = factor leaf weight/plant weight, K = L × B/A and N = number of leaf samples. Leaf area, leaf dry weight and entire plant dry weight calculated from the above 3 formulae were found to agree consistently to within 5% of experimental error.—P.M.G.

805 MULDER, E. G. **Effect of mineral nutrition on lodging of cereals.** *Plant and Soil* 1954, **5,** No. 3, 246–306, bibl. 39, illus. [Agric. Exp. Sta. and Inst. Soil Res. T.N.O., Groningen, Netherlands]

The effect of N, P and K nutrition on lodging and yields of cereals was studied during 1940–9. Favourable growing conditions during the early part of the growing season, particularly during elongation of the lower culm internodes, resulted in crops with a considerable tendency to lodge. A combination of ample N, relatively high temperatures and optimum moisture supplies at this stage almost invariably resulted in high liability to lodging. Low light intensities in the stem region, caused by shading, high plant populations, or heavy weed infestation, also increased the tendency to lodge. A relatively poor moisture supply during elongation of the lower culm internodes resulted in high resistance to lodging. In most cases, lodged crops had bent, and sometimes broken, lower internodes. Increasing the rate of N supply resulted, in many cases, in increased diameter of upper culm internodes, and no increase, or slight decreases, in the diameter of lower culm internodes. The thickness of the sclerenchymatous ring, sclerenchymatous cell walls and the area of lignified tissue in the sclerenchymatous zone all tended to decrease with increased N supply. Vascular-bundle numbers were not affected by N supply, but lignification of these bundles and of the outer layers of the parenchyma tended to decrease with increased N supply. High rates of N supply tended to produce weakened and less lignified root systems. In pot trials, the effect of N in increasing the tendency to lodge was partly due to the effect of shading on lower culm internodes and partly to a direct nutritional effect. Elongation of lower culm internodes was the result of shading, while reduction in culm diameter, culm-wall thickness and lignification was the result of both shading and the direct effect of N. Excessive supplies of K had no effect on culm strength. P-deficient plants had less tendency to lodge than those adequately provided with P. Poor soil structure had no effect on liability to lodge. A number of different methods was used for estimating grain yield reduction caused by lodging. Grain yield losses caused by lodging ranged from nil to 60%.—From author's summary.

806 COOKE, G. W. and WIDDOWSON, F. V. **The value of nitrophosphate for spring-sown cereals.** *J. agric. Sci.* 1956, **47,** Pt. 1, 112–15, bibl 5. [Chem. Dep., Rothamsted Exp. Sta., Harpenden]

Thirteen experiments on spring cereals were carried out from 1952–4 to compare broadcasting with combine-drilling for nitrophosphate and for mixtures of superphosphate plus equivalent N. Broadcast nitrophosphate was of little value; drilled dressings were much more effective. Superphosphate drilled with the seed produced consistently higher yields than when broadcast. Superphosphate plus equivalent N gave higher average yields than nitrophosphate both when broadcast and when drilled. When the dressings were broadcast, superphosphate was markedly superior to nitrophosphate, but when drilled with the seed, average yields with superphosphate were only a little higher than with nitrophosphate. Nitrophosphates may be substituted for mixtures containing water-soluble P for cereals provided that they are drilled with the seed, but they may give poor crops in conditions where the plants need a rapid start.—From authors' summary.

807 FORBROTHER, H. G. **A simple device for assessing the moisture content of grain.** *Emp. Cott. Gr. Rev.* 1955, **32,** No. 4, 281–3. [Emp. Cott. Gr. Corp., Namulonge, Uganda]

A moisture meter based on the principle of measuring the electrical leakage between two probes is described and illustrated. The probes are plunged for the whole of their length into the grain to be assessed. The handle of the generator is turned rapidly and the moisture content is assessed by the brightness of glow of the neon-indicator lamp. While it is not claimed to be a precision instrument, its use makes it easy to determine, with a little practice, whether or not a stock of grain is dry enough to store safely.—P.M.G.

808 WENNER, H. L. Die Voraussetzungen für die Lagerung und Belüftung von feuchtgeerntetem Getreide. [**Requirements for storage and ventilation of cereal grain harvested in a damp condition.**] *Ber. Landtechn. 45. Inst. Landtechnik.* 1955, pp. 96, bibl. 27, illus., Frankfurt/Main; Kuratorium für Technik in der Landwirtschaft., [Bonn, W. Germany]

When using the combine-harvester, the cutting of cereals must be delayed until the grain has reached the " dead ripe " stage, if the grain is to be stored.

At this stage, the internal moisture content [derived from the plant] is reduced to less than 14%. The author draws attention to the 2 sources of moisture in grain and their effect on storage properties. (1) Water derived from the plant decreases in quantity as grain maturity is reached, until, at the "dead ripe" stage, it is 14% or less. Unripe grain, with a high content of moisture derived from the plant, heats during storage so that the grain goes bad and soon loses its germination capacity. (2) Water of imbibition enters from without, its quantity varying with the weather; the author states that water of imbibition does not cause grain to heat during storage. Methods of storing grain are discussed with special reference to slow drying by forced ventilation with atmospheric air, a method which is suitable and economic for small farms. The air stream has both a preservative and a drying action, and for each of these actions great importance is attached to the volume of air per hour which passes through the stacks. If grain is stored at 22% moisture, the drying can extend over 10 days, but if the moisture content of the grain is higher, drying must be speeded up and completed within 6 days by increasing the quantity of air passing through per hour. Tables are given which show the rate of ventilation in a variety of circumstances, such as moisture content of grain, air temperature and humidity. Usually 300 $m.^3$ of air per hr. per $m.^3$ storage space suffice to preserve even moist grain from spoiling.—D.B.

809 HAMBLIN, H. J. and CHALMERS, G. H. **A drill for trueness-to-type cereal plots.** *Tech. Mem. 126. Nat. Inst. agric. Engng* 1955, pp. 4, illus.

The drill was designed for experimental purposes. It is possible to empty, clean and inspect it thoroughly and quickly at the end of each plot and re-charge it without delay. The drill is also capable of covering the seed as it is drilled. A comprehensive description is given.—From authors' abstract.

810 MILLER, Jean G. and MOUNTIER, N. S. **The border row effect in wheat trials with different spacings between plots.** *N.Z.J. Sci. Technol. Sec. A.* 1955, **37,** No. 4, 287–99, illus. [Dep. Agric., Wellington]

The effect on plot yields of including border rows in drilled cereal trials was evaluated in 3 tests where two contrasting varieties were sown at different spacings. Significant differences in plot yields were almost always recorded between the spacings 7 in., 14 in., 18 in., and 28 in., when the outside rows were included. The yields of the second rows from the edge did not vary according to the spacings between plots. There was no clear evidence of a competition effect between varieties, and the effect on the relative merits of the varieties differed in the 3 trials. No advantage from using 7 in. or 28 in. spacings, instead of the standard 14 in., was apparent. Coefficients of variation were increased when border rows were included, if the error was calculated to include variations due to different spacings. This corresponds to the case in routine trials where the actual gap between plots varies from 7 to 18 in. Where no spacings differences contribute to error, as in the case of a very accurately drilled trial, the coefficients of variation were not affected by the inclusion of outside rows at the 14 or 18 in. spacings. The conclusions are that while in some cases whole plots may be harvested, in most cases (where the drilling is not extremely accurate or competition effects may exist) the trial will be improved by the removal of outside rows. These results apply only to variety trials in which there are no extreme differences of habit or yield between the varieties concerned.—From authors' summary.

LEGUMES

SOYABEANS

811 HOLMBERG, S. A. **Soya-bean adaptation in Sweden.** *World Crops* 1956, **8,** No. 3, 99–103, bibl. 14, illus.

A review is given of current progress in the production of soyabean varieties adapted to Sweden, with particular reference to the temperature-, light- and daylength-requirements of soyabeans and the adaptability of strains derived from northern Japan for Swedish conditions.—P.J.B.

812† GANDHI, R. T. **The new soybeans for your farm.** *Indian Fmg* 1956, **5,** No. 10, 7–8, illus. [Indian Agric. Res. Inst., New Delhi]

The new varieties, Monetta, Clemson and Palmetta, are of American origin. Green fodder is usually available from these varieties in 45–50 days, and seed in 65–70 days, from sowing. The August-sown crop of these varieties matures by mid-October, leaving time to prepare land for the sowing of rabi crops. The local yellow varieties take from 145 to 160 days to mature. The seeds of the new varieties are straw yellow in colour and bolder in size (3450 to a pound) than those of the local variety (9550 to a pound).—P.M.G.

813 ATHOW, K. L. and CALDWELL, R. M. **The influence of seed treatment and planting rate on the emergence and yield of soybeans.** *Phytopathology* 1956, **46,** No. 2, 91–5, bibl. 16. [Purdue Univ. Agric. Exp. Sta., Lafayette, Indiana]

In trials during 1947–9, 4 soyabean varieties were grown in spaced-row tests. Rows were spaced 40 in. apart and seed was hand placed at intervals

ranging from 0·5 to 4 in. apart in the row, representing approximate sowing rates from 15 to 120 lb. per ac., respectively. In drill-plot tests, the seed of 2 varieties was sown at rates ranging from 23–82 lb. per ac., to give approximate seed spacings of 1–3·5 in. in the row. Rows were 28 in. apart. The seed in both trial series was treated with Arasan or Spergon dusts at rates of 2 oz. per bu. of seed. Stand counts were made when emergence was complete. In the spaced-row tests, where seed was sown in 1947 at spacings of 0·5, 2 and 4 in. in the row, emergence was 69, 61 and 59%, respectively. The overall increase in emergence following seed treatment was 4%. Seed treatment exercised its most favourable effect on emergence where sowing rates were highest. In 1948, the average increase in emergence following seed treatment was 16%, but only 7% in the case of the seed lot with the best quality. In 1949, neither seed treatment nor rate of sowing had any effect on emergence. In the drill-plot tests in 1949, Arasan resulted in an increase in emergence of 4·5% and Spergon increases of 8·6 and 6·4% for Hawkeye and Lincoln, respectively. In 1950, increases in emergence following seed treatment were relatively small. In the spaced-row tests, seed spacings of 4 in. in the row resulted in significantly lower seed yields than where 1 or 3 in. spacings were used. Only where 4 in. spacings were used, did seed treatment result in significant yield increases, compared with where no seed treatment was used. In the drill-plot tests, yields were reduced where spacings of more than 1·5 in. between seeds in the row were used, irrespective of seed treatment, mainly as a result of the lack of uniformity of seed spacing. From these results, it was concluded that seed treatment could be of value where seed quality was low, or sowing rates very low. Under normal conditions, however, seed treatment was thought to have no practical value.—P.J.B.

814 STARKS, K. J. and LILLY, J. H. **Insecticide seed treatment of soybeans in relation to phytotoxicity and seed-corn maggot control.** *J. econ. Ent.* 1955, **48,** No. 5, 538–43, bibl. 4. [Iowa Agric. Exp. Sta., Ames]

In field tests, soyabeans of high viability were not appreciably injured—as shown by stand counts—by treatment with emulsions of Diazinon, recrystallized Aldrin, Heptachlor, Dieldrin and Lindane, and only slightly injured by 2 oz. per bu. doses of these insecticides used in wettable powder formulations. Lower doses of some of these insecticides severely damaged seed which had been stored for about 19 months before being treated. Diazinon, Lindane and Heptachlor used as seed treatments increased stands in plots infested with seed-corn maggots (*Hylemya cilicrura*). No difference of importance was noted in the protection given by one-third, two-thirds and one oz. doses of the insecticides, either alone or in combination of with Captan.—E.B.O.

815 KLYKOV, A. P. [**New forms of soyabean from seeds which have imbibed water slowly.**] [Russian] *Doklady Vsesojuz. Akad. S.-H. Nauk* (*Proc. Lenin Acad. agric. Sci.*) 1956, **21,** No. 1, 13–15, bibl. 5. [Kostyčev Agric. Inst., Rjazan]

From observations made at the above Institute it is claimed that the varying sowing quality of soyabean seeds depends on the rate at which the seed imbibes water. A low absorption of water (i.e. absorption which begins 4 to 10 hr. after submersion) produces a hardier seedling and this feature may be useful in selecting soyabean (or other leguminous) strains for growing in latitudes higher than usual.—M.H.

816 ZEEUW, D. de and LEOPOLD, A. C. **The promotion of floral initiation by auxin.** *Amer. J. Bot.* 1956, **43,** No. 1, 47–50, bibl. 11, illus. [Purdue Univ., Lafayette, Indiana]

The effect of auxin (naphthaleneacetic acid) upon flowering of the short-day species cocklebur and Biloxi soyabean has been studied. Special attention has been paid to the effect of the time of application and of the concentration of the auxin. The study has led to the following conclusions. A low auxin concentration (1–5 ppm.), applied before the induction period, had a pronounced promotive effect on floral initiation of these short-day species. A smaller promotive effect was also obtained when the auxin was applied after the induction period. The effect of the auxin on floral initiation followed a two-phase concentration curve similar to the other growth responses to auxin.—Authors' summary.

817 BELIKOV, I. F. [**Movement and distribution of photosynthetic products in soyabean plants during the vegetative period.**] [Russian] *Fiziol. Rast.* (*Pl. Physiol., USSR*) 1955, No. 4, 354–7, bibl. 2. [Far-East Filial Acad. Sci. USSR, Vladivostok]

Following the author's earlier work [see Abs. 111], a study was made (using labelled carbon) of the allocation of assimilates to various organs in *Glycine* sp. at different stages of development. Under the conditions of the tests, there is evidence that assimilates accumulate in the growing tips of stems and in young leaves, but at seed formation the stream of assimilates is directed towards the developing fruits. Mature leaves do not share their assimilates with each other even if, in some, there is a deficiency. This may explain the rapid leaf-fall under unfavourable conditions, especially that of shade.—M.H.

818 MEDERSKI, H. J. and WILSON, J. H. **Effect**

of soil temperature and soil moisture on manganese absorption by soyabean plants. *Proc. Soil Sci. Soc. Amer.* 1955, **19,** No. 4, 461–4, bibl. 15. [Agron. Dep., Ohio Agric. Exp. Sta., Wooster, Ohio]

GROUNDNUTS

819 ARTHUR, B. W. and ARANT, F. S. **Control of soil insects attacking peanuts.** *J. econ. Ent.* 1956, **49,** No. 1, 68–71, bibl. 6. [Alabama Agric. Exp. Sta., Auburn]

The principal insect species causing damage to groundnuts in the soil in Alabama were the larvae of the southern corn rootworm (*Diabrotica undecimpunctata howardi*), the banded cucumber beetle (*D. balteata*), the lesser cornstalk borer (*Elasmopalpus lignosellus*) and a wireworm (*Conoderus* sp.). In 1953, the insect damage was reduced and groundnut yields were increased significantly over those from the controls where Aldrin, Dieldrin or Toxaphene granules were applied to the surface of the soil when the plants began to peg themselves down. Aldrin and Dieldrin were used at the rate of 2 lb. technical material per ac. and Toxaphene at the rate of 6 lb. per ac. Increases in yield at Headland on sandy soil ranged from 289 to 442 lb. of cured groundnuts per ac. Increases were lower at Troy on clay soil.—From authors' summary.

820 BUNTING, A. H. **A classification of cultivated groundnuts.** *Emp. J. exp. Agric.* 1955, **23,** No. 91/2, 158–70, bibl. 14, illus. [Res. Div., Sudan Minist. Agric.]

More than 200 varieties of cultivated groundnuts in the Tozi Research Farm collection were studied in detail in Tanganyika and the central Sudan. A new system of classification is put forward based on 2 different patterns of branching : form A, the alternate branching type, in which vegetative and reproductive secondary branches alternate, usually in pairs, on the primary branches ; form B, the sequential branching type, in which a continuous sequence of nodes on the primary branches bear reproductive branches, and later nodes are sterile. Vegetative secondary branches, in this latter form, are rare or only at the first and second nodes of the primaries. The two forms are agronomically distinct and the characters studied are discussed. A, which corresponds to the Virginia types of the USA, consists of the true runners and spreading-bunch forms. They are all long-season forms of a somewhat indeterminate growth period subject to environmental restrictions and may even be weakly perennial. They are all dark green ; the kernel colour is almost invariably a deep russet brown, and all seeds appear to have dormancy. B corresponds to the Spanish and Valencia types. They are all short-season annuals, are a lighter-green than A, have a the upright-bunch habit with ascending lateral branches which do not overtop the main axis. The kernel colour, where brown, is bronze or light brown, and no seed appears to have dormancy. A key is given to the 22 groups of cultivated groundnuts in the Tozi collection, with descriptions of some of the groups. The choice of criteria was based on clearly identifiable characters considered to be of agronomic significance and determined on living plants.—M.P.

821 SMITH, B. W. ***Arachis hypogaea.* Normal megasporogenesis and syngamy with occasional single fertilization.** *Amer. J. Bot.* 1956, **43,** No.2, 81–9, bibl. 19, illus. [North Carolina State College, Raleigh]

A cytological examination of the reproductive process of *Arachis hypogaea* from ovule initiation to syngamy was made in order to discover the causes of seed failure in externally normal fruits. There were instances of failure of syngamy, single instead of double fertilization, and failure of endosperm development. There was no evidence of parthenogenetic embryo development.—D.B.

822 SHIBUYA, T. and others. **Morphological and physiological studies on subterranean fructuation of legume crops. 2. Occurrence of one-seeded fruit induced by fertilization failure in peanut. 3. Fertilization and fruit formation performed by under-ground flower of peanut.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **24,** No. 1, 16–19, illus., English summary. [Agric. Fac., Univ. Hokkaido, Japan]

823 NUCHOWICZ, A. Recherches sur la culture d'embryons et de fragments d'embryons d'*Arachis hypogaea* L. [**Research on the culture of** [**excised**] **embryos and of sections of embryos of *A. hypogaea*.**] *Agricultura, Louvain* 1955, **3,** No. 1, 3–37, bibl. 21, illus. [Univ. Louvain, Belgium]

These experiments on cultivating excised and divided embryos are preliminary, yet fundamental, experiments in a wider programme for increasing the means of vegetative reproduction in *Arachis hypogaea*. If plants could be grown from divided embryos this should theoretically, at least, double the number of vegetative descendants. (a) Embryos as excised whole embryos, (b) embryos from which one cotyledon was removed, (c) embryos from which two cotyledons were removed, and (d) embryos divided longitudinally were cultivated for 8 days in an artificial nutrient medium and then transplanted into pots. From (a) and (b) normal plants could be grown in 8 days, but in the case of (b) the lateral branch on the side without a cotyledon grew very slowly. From (c), the main axis

grew normally, but lateral buds did not develop whatever nutrients were used in the medium. Bisected embryos (d) grew feebly, plumules became green, and the primary root elongated and produced rudimentary secondary roots. Cuttings of young stems placed in a nutrient solution produced adventitious roots, and indole acetic acid at a concentration of 0·002 mg./l. favoured the formation of adventitious roots. Removal of the terminal bud inhibited the development of lateral buds. Adventitious budding, natural and induced, should be investigated in cultivated plants under normal conditions.—D.B.

824 INOUE, Y. and SHIBUYA, M. **Effects of defloration on the flowering and fruiting in peanut (*Arachis hypogaea* L.).** [Japanese] *J. hort. Ass. Japan* 1955, **24,** No. 3, 175-80, bibl. 15, English summary.

Studies were made of the effect of flower removal on the growth, flowering and fruiting of groundnuts. The plants were sown on 6 May or 6 June and all buds were removed for periods of 15, 30 or 45 days from the beginning of flowering. Total weights of seed produced per plant differed little between each treatment and the untreated controls, except that plants sown in June and from which buds were removed for a 45-day period gave very low seed yields.—From authors' summary.

825 MINISTÈRE DE LA FRANCE D'OUTRE-MER. Comptes rendus de la Conférence arachide-mil, Bambey (Sénégal), 5–13 Septembre 1954. [**Proceedings of the Conference on Groundnuts and Millet, Bambey, Senegal, 5-13 September, 1954.**] *Bull. agron. 12. Fr. d'out. mer* 1955, pp. 222, bibl.

Among the papers presented at this Conference, attended by French, British and Portuguese delegates, were the following :

1. NPK manuring of groundnuts in Senegal. By R. Tourte, pp. 82–5. The adequate dose of NPK fertilizer was found to be about 150 kg. per ha. This amount raises yields by at least 25%, increases of 40% being recorded. From a study of a great number of NPK mixtures, the following were retained for 2-years' application : (a) 9·6–14·4–8·0 for most regions of western Senegal and Casamance; (b) 5·5–21·8–9·1 for central and eastern Senegal ; (c) 5·8–11·5–21·8 for soils with a high phosphoric-acid content (Thiès area) and for those repeatedly cropped with groundnuts.

2. Green manure in Senegal and the French Sahel-Sudan. By R. Tourte, pp. 86–9. [See Abs. 930.]

3. Storage of groundnut seeds. By F. Bouffil, pp. 109–11. Groundnut seeds in Senegal are stored in the open from harvest to sowing almost exclusively by the Sociétés de Prévoyance. Brief information is given on the damage caused by insects, rain and sun to these seeds. It is recommended that they be stored under a roof of sheet iron on a floor of sand, and surrounded by wire-netting.

4. Control of the groundnut weevil (*Pachymoerus cassiae*) in "seccos" (groundnut heaps stored in the open air). By J. Appert, pp. 112–16. In Senegal during the last 2 years serious damage was caused by weevils in some seccos although they had been dusted with Acricide 25 (25% BHC). The principal cause of this infestation appeared to be the imperfect way in which the insecticide had been applied. Advice is given on applying the dust so that all parts of the heap are treated. The relatively rapid loss of toxicity observed in the insecticide was thought to have been favoured by the exposure of the heaps to rain and sun.

5. *Aphanus sordidus*, a pest of groundnuts in storage. By J. Appert, pp. 117–21. Control measures are given.

6. The production of groundnuts and millet (*Sorghum* and *Pennisetum* spp.) in Senegal. By A. Marchal, pp. 145–51.

7. Groundnuts in French Guinea. By M. Bayle, pp. 155–60. Information is given on groundnut cultivation and production in that region, including crop areas and varieties. The principal varieties grown are : Koniagui in the Youkounkoun, and Tiga in Upper-Guinea. Information is also given on the work carried out at the agricultural station at Kankan.

8. Groundnuts and millet in Dahomey. By M. Baron, pp. 161–6. Information is given on the cultivation of groundnuts, millet (*Pennisetum* spp.) and sorghum in northern and central Dahomey, including details of varieties, crop areas and production.

9. Millet (*Sorghum* and *Pennisetum* spp.) and groundnuts in the French Sudan. By M. Clérin, pp. 167–70. Information is given on crop areas, cultivation and production.

10. The crop cycle groundnuts/millet in Portuguese Guinea. By A. L. Cabral, pp. 171–4. [See Abs. 927.]

11. Bush fires and fallows in the crop cycle groundnuts/millet. By A. L. Cabral, pp. 175–82.

12. Groundnuts in northern Nigeria. Research and improvement. By M. Maurer, pp. 183–4.

13. Work with groundnuts at the agricultural station at Guétalé, northern French Cameroons. By M. Barbe, pp. 185–91. Trials carried out before 1954 indicated the superiority of the variety Soudan 28.206. Details are given of trials in progress in 1954 in which the varieties 28.206 SAG, 28.206 Boulel and 28.207 Bambey were tested.

14. Varietal and cultural trials with groundnuts at the Ba-Illi Station for Agronomic Research, Chad. By M. Niqueux, pp. 203–6. Results showed that high yields are obtained in Chad by (a) early sow-

ing, as soon as sufficient rain has fallen ; (b) a plant density of about 80,000 plants per ha. ; (c) using the variety Bambey 28.206, or local varieties of the Virginia Bunch type.
15. A study of boron deficiency in groundnuts. By M. Lévêque, pp. 209–11.——E.B.O.

826 NYASALAND FARMER AND FORESTER. **Groundnut experiments, 1954–55.** *Nyasald Fmr For.* 1955, **3,** No. 1, 36–7.
INVESTIGATIONS REPORTED :
1. Variety trials, p. 36. Varieties are required for 3 distinct groups of climatic and soil conditions. (1) Under the marginal conditions for groundnut-growing at Mbawa in the N. Province, the late runner-types gave the best results over a 3-year period. These varieties are U/A29, U/A35, U/A36, SA/A6 and Chimbuwila, and should average 800–1000 lb. shelled nuts per acre. The late-maturing semi-bunch varieties Mwitunde and S/A4 Jur also did well. (2) At A.R.S., bunch types usually do best. The varieties Barberton, Gambia and Natal Common gave mean yields of over 1600 lb. per ac. The runner varieties U/A39 and SA/A6 also gave mean yields of about 1600 lb. Mwitunde yielded about 1600 lb. and had the advantages of dormancy and ease of lifting. (3) At Tuchila, Makanga and Chitala, the early bunch types were best. U/A18, U/A40, and U/A41, which may give over 1600 lb. seed [sic] per acre, were most suitable at Tuchila. At Makanga, Gambia U/A18 and Natal Common gave about 800 lb., and at Chitala, SA/A2 Masambika gave over 1600 lb. and U/A8 and U/A18 gave over 1200 lb.
2. Time of sowing and lifting, pp. 36–7. Early sowing gave the highest yields with both early and late varieties. The early variety Spanish Bunch is liable to sprout in the ground and must be harvested at about 100 days after sowing. Mwitunde can be left unharvested for 130–140 days.
3. Control of Cercospora leaf spot, p. 37. Copper (Perenox)- sprayed plots gave a significant increase in yield over the control and the non-copper-sprayed plots. The Perenox did not completely control the disease and may have acted partly by correcting a possible copper nutrient deficiency.—P.M.G.

PEAS

827† MINISTRY OF AGRICULTURE, FISHERIES AND FOOD. ENGLAND AND WALES. **Growing field peas for stock feeding.** *Adv. Leafl. 300. Minist. Agric., Fish., Fd England and Wales* 1955, pp. 5.

828 NATTI, J. J. and SCHROEDER, W. T. **Silicones as lubricants for pea seed protectants.** *Pl. Dis. Reptr* 1955, **39,** No. 12, 909–13. [New York State Agric. Exp. Sta., Geneva]
Pea seed treatment with the silicone emulsions LE-45 and LE-46 at a rate of 0·5 pt. per bu. increased the amount of seed delivered per minute by a grain drill by about 6%, while X-521, a waxy material, reduced seed delivery rates by about 2%. Orthocide 75 and Arasan dusts reduced the rate of delivery by 15 and 4%, respectively, while Spergon had no apparent effect. The use of LE-45 and X-521 overcame the flow-retarding effects of Orthocide 75 dust ; LE-46 was not so effective as the other silicones. Delsan A-D water slurry reduced the rate of seed flow by 14%, while the use of X-521 instead of water increased the rate of flow by about 1% over that of untreated seed. With Ortho Seed Guard water slurries, silicone emulsion X-521 substituted for water resulted in seed-flow rates similar to those of untreated seed. The silicones had no effect on the fungicidal activity of the seed treatments, or on seed germination in soil in greenhouses and in the field.—P.J.B.

829 SHORROCK, R. W. **Peas and sprays.** *Fmr's Wkly, Lond.* 1956, **64,** No. 12, 95–7, illus.
Weeds in peas can be controlled by applications of the amine or ammonium salt of Dinoseb (DNBP) or by MCPB. Rates of application, weeds affected, and varieties of peas unaffected by MCPB are given.—C.L.S.

830 BUCHHOLTZ, K. P. **Some factors affecting the tolerance of peas to MCP and other growth regulating herbicides.** *Weeds* 1954, **3,** No. 4, 331–41, bibl. 15. [Wisconsin Agric. Exp. Sta., Madison]
MCPA was less toxic to canning peas than 2,4–D and slightly less toxic than 2,4,5–T. 3,4–D and 4–chlorophenoxyacetic acid appeared to be similar to MCPA in toxicity. Esters of MCPA were more toxic than the amine and Na salts, which were similar in toxicity. Applications of 0·25 lb. MCPA per ac., made to peas 6 in. tall, resulted in occasional yield reductions. The variety Alaska was more susceptible to MCPA than H-539 and Perfection. Spray volumes less than 40 gal. per ac. were thought likely to cause more injury to peas than higher spray volumes.—From author's summary.

831 MAPSON, L. W. and MOUSTAFA, E. M. **Ascorbic acid and glutathione as respiratory carriers in the respiration of pea seedlings.** *Biochem. J.* 1956, **62,** No. 2, 248–59, bibl. 22, illus. [Low Temp. Sta. Res. Biochem. Biophys., Univ. Cambridge and D.S.I.R.]

832 GIBBS, M. and others. **Respiration of the pea plant. Metabolism of hexose phosphate and triose phosphate by cell-free extracts of pea roots.** *Pl. Physiol.* 1955, **30,** No. 5,

463–7, bibl. 26, illus. [Brookhaven Nat. Lab., Upton, Long Island, New York]
The paper is a discussion, based on experimental work, of the enzymes present in cell-free extracts of young pea roots.—D.B.

833 HIGHKIN, H. R. **Flower-promoting activity of pea seed diffusates.** *Pl. Physiol.* 1955, **30,** No. 4, 390, bibl. 3. [Calif. Inst. Technol., Pasadena]
It has been shown experimentally that the diffusate from pea seeds contains a factor which can promote flowering in plants grown from other pea seeds, and that it can be used to replace vernalization. The diffusate is effective whether it has been prepared at 4°C. (vernalized) or 23°C. (unvernalized). Like vernalization, its effect is to reduce the number of nodes before formation of the first flower.—D.B.

834 MCKEE, H. S. and others. **Physiology of pea fruits. 2. Soluble nitrogenous constituents in the developing fruits.** *Aust. J. biol. Sci.* 1953, **8,** No. 4, 467-75, bibl. 22, illus. [Bot. School, Univ. Sydney]
See also Abs. 124.] Soluble N compounds in the seeds and hulls of developing fruits of the pea *Pisum sativum* var. Canner's Perfection) were studied at successive stages of growth during two seasons. Of the 26 compounds studied, some were undetectable in some samples and all decreased in the seeds during the period of intense protein synthesis. The results are discussed in conjunction with those of other workers.—Authors' summary.

835 JANSSON, S. L. and TORSTENSSON, G. Kvavegodslingens inverkan pa artskordens storlek och sammansattning. [**Effect of nitrogenous fertilizers on the yield and composition of peas.**] *K. LantbrAkad. Tidskr., Stockh.* 1955, **94,** No. 2–3, 210–20, bibl. 20, German summary.
The pea variety Torsdags II received N in combination with different doses of K and Ca in a five-year pot trial. On the whole, no advantage was derived from the use of N. The yield of straw was increased, but the quality of the seed deteriorated.—G.M.R.

BEANS

836 KAWAMURA, S. **The composition of the seed of *Vicia faba*.** [Japanese] *Tech. Bull. Kagawa-Ken agric. Coll.* 1954, **6,** No. 1, 8–19, bibl. 115.
Data are given of the chemical composition of *V. faba* seed, including the amino-acid, mineral and vitamin contents, according to the literature published by different workers.—P.J.B.

837 KAWAMURA, S. and others. **Studies on the carbohydrates of the seed of *Vicia faba*. 1. Analysis of beans, mainly for carbohydrates.** [Japanese] *Tech. Bull. Kagawa-Ken agric. Coll.* 1954, **6,** No. 1, 20–6, bibl. 13, Esperanto summary.

838 KAWAMURA, S. and others. **Studies on the carbohydrates of the seed of *Vicia faba*. 2. Sugars.** [Japanese] *Tech. Bull. Kagawa-Ken agric. Coll.* 1954, **6,** No. 1, 27–31, bibl. 6, Esperanto summary.

839 NADA, I. A. A. and RAFAAT, A. **Carbohydrate changes during germination of *Vicia faba* seeds.** *Indian J. agric. Sci.* 1955, **25,** No. 4, 271–80, bibl. 12. [Dep. Agric. Bot., Fac. Agric., Cairo Univ., Egypt]

840 WAY, J. M. **Beans and blackfly. A single spray will free this crop.** *Agric. Rev., Lond.* 1955, **1,** No. 5, 51–3, illus. [Rothamsted Exp. Sta., Harpenden, Herts]
For control of black bean aphid it is recommended that spring beans should be sown in February or early March in rows 2 ft. apart. Spraying with an insecticide should be carried out once in mid-June. Outstanding results have been achieved with the systemic insecticides Metasystox and Systox. BHC, nicotine and Parathion have also given good control of blackfly. The insecticides should be applied at high volumes (100 gal. per ac.). [The concentration is not stated.] A mid-June spraying has the advantage of causing least damage to the plants and of killing the aphids when they are still at the top of the bean plants and when their number is still low. In experiments at Rothamsted a single mid-June spraying increased the yield from 29 to 33 cwt. per ac. in 1953, when the aphid attack was mild, and from 17 to 35 cwt. in 1954, when the aphid attack was severe.—M.P.

841 SCHMIDT, G. Über die Einwirkung von Umweltbedingungen, insbesondere von der Stickstoffernährung auf die Knöllchenbildung und N–Bindung von *Vicia faba* L. [**The effect of environment, especially N-nutrition, on the nodulation and N fixation in *Vicia faba*.**] *Kühn-Arch.* 1955, **69,** No. 2, 165-222, bibl. 40. [Martin-Luther Univ., Halle-Wittenberg, E. Germany]
Of the following N-containing salts, $Ca(NO_3)_2$, NH_4NO_3, NH_4HCO_3 and $(NH_4)_2SO_4$, applied to *Vicia faba* grown in water culture, $Ca(NO_3)_2$ had the most favourable influence on nodulation and N-fixation. The season of the year at which the salts were added was important, early spring and autumn being more favourable than late spring and winter. Compared with non-shaded plants, shading reduced nodulation and N-fixation of plants which were sup-

plied with N salts, but had no effect on nodulation of plants without a supply of N salts.—D.B.

842 BALLATORE, G. P. Orientamenti sulla concimazione della fava da granella in Sicilia. [**The manuring of bean (*Vicia faba*) grown for seed in Sicily.**] *G. d. Sicilia* 1954, pp. 9, bibl. 17. [Received Nov., 1955]

The manuring of beans with about 800 kg. of superphosphate per ha. gave considerable increases in yield, 100% in some cases, compared with yields from unmanured crops. This fertilizer should be applied at the beginning of autumn before sowing, and mixed with the soil by cultivation.—E.B.O.

OTHER

843† KURTH, H. Über das Zusammenwirken von Jarowisation und Photoperiodismus beieinigen Leguminosen, insbesondere bei *Vicia villosa* Roth. [**The combined action of vernalization and photoperiod in some legumes, in particular *Vicia villosa* Roth.**] *Züchter* 1956, **26,** No. 3, 71–8, bibl. 16, illus. [Univ. Greifswald, Mecklenburg, E. Germany]

Experiments involving vernalization and length of day have revealed that vernalization during germination can largely mask the effect of photoperiod in increasing the rate of development.—D.B.

844† SASTRY, K. S. and SARMA, P. S. **The nature of the effect of ammonium sulphate on the biosynthesis of ascorbic acid in plants.** *Biochem. J.* 1956, **62,** No. 3, 451–5, bibl. 13. [Univ. Biochem. Lab., Univ. Madras, Madras, India]

Ammonium sulphate inhibits the conversion of uniformly labelled [^{14}C] glucose into ascorbic acid. This inhibition accounts quantitatively for the observed decrease in ascorbic acid content of *Phaseolus radiatus* seedlings grown in the presence of the inhibitory salt. Ammonium sulphate has no effect on the catabolism of ascorbic acid.—From authors' summary.

845 KAR, A. **The stipules, pulvinus and stipels of *Dolichos lablab* L. and their vascular supply.** *Proc. nat. Inst. Sci., India* 1955, **21,** No. 3, 137–40, bibl. 20, illus. [Bot. Lab., Presidency Coll., Calcutta]

GENERAL

846 MOTOHIRO, K. **Comparative studies of the vascular differentiation in some hypogaeous dicotyledons at young stage with special reference to its morphology.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **24,** No. 1, 12–15 illus., English summary. [Tokai-Kinki Agric. Exp. Sta., Japan]

The results are given of studies on vascular differentiation in 13 leguminous species.—From author's summary.

847† LECHNER, L. Ergebnisse und Schlussfolgerungen aus Importsaatprüfungen zu Futter- und Gründüngungsleguminosen 1953. [**Results and conclusions from the 1953 trial with imported seed of legumes for fodder and green manure.**] *Saatgutwirtschaft* 1956, **8** No. 1, 11–13, illus. [Bayer. Landessaatzuchtanstalt, Weihenstephan/Oberbayern]

[See Abs. 484.] The green- and dry-matter, crude protein and seed yields of imported varieties of fodder peas, lupins and vetches are tabulated. Most of the introductions were superior to the local German varieties.—M.P.

ROOTS

SUGAR-BEET

848 HELLER, C. Untersuchungen über die Saatbettgestaltung bei Zuckerruben. [**The condition of the seedbed for sugar-beet.**] *Dtsch. Landw.* 1956, **7,** No. 2, 73–7, bibl. 7, illus. [Inst. Landtechnik., Univ. Bonn, W. Germany]

The paper is a discussion on the emergence of sugar-beet plants from normal and monogerm seed under various combinations of conditions which included sowing date, depth of sowing, and quality of seed bed. As regards depth of sowing, there was little difference in emergence when sown at 1·5 cm or 2·5 cm., except that from a depth of 2·5 cm emergence was a day later than from 1·5 cm. However, under dry conditions 1·5 cm. was too shallow. The sowing depth should be such that the seed is in contact with moist soil.—D.B.

849 OWEN, P.C. and WATSON, D. J. **Effect on crop growth of rain after prolonged drought.** *Nature, Lond.* 1956, **177,** No. 4514, 847 [Rothamsted Exp. Sta., Harpenden, Herts]

An investigation into the effect of irrigation on the growth of a sugar-beet crop was started in 1955 at Woburn, Bedfordshire. Under conditions of the test there is evidence that, after prolonged drought (from early July to mid-August), small amounts of rainfall (i.e. small compared with the estimated soil-moisture deficit of approx. 6 in.) caused such large increases both in leaf growth and in rate of photosynthesis of unirrigated plants that, temporarily, these plants grew faster than those irrigated which had not been subjected to severe water stress.—M.H.

850 PETO, F. H. **Sugar losses caused by frost defoliation.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8,** Pt. 1, 171–5, bibl. 3. [British Columbia Sugar Refining Co., Ltd., Vancouver]

In field trials in British Columbia, sugar-beet was subjected to freezing and defoliation treatments on 9 September. The freezing treatments consisted of placing an insulated box over the plants and exposing them to dry CO_2 for 13 min. This froze the leaves and part of the petioles, but did not injure the crowns. Defoliation consisted of cutting off the leaves and petioles, leaving the crowns intact. The roots were sampled at 2 or 12 days after treatment. Freezing and defoliation resulted in average reductions of 1·56 and 1·74%, respectively, in the sugar content of the roots, compared with untreated controls. The average daily sugar losses for 2 and 12 days regrowth were 0·2 and 0·24%, respectively. This indicated that sugar loss began very soon after treatment. Neither freezing nor defoliation resulted in root-weight losses or reductions in sugar purity. Where the roots were stored for 10 days at 36°F. after freezing or defoliation treatments, sugar contents increased by 0·66 and 0·32% where 2 and 12 days, respectively, elapsed before the storage treatments began.—P.J.B.

851 DALMEYER, W. H. M. **Pre-emergence weed-killing, particularly in sugar beets.** *Meded. LandbHogesch., Gent* 1955, **20,** No. 3, 377–9. [Roy. Shell Lab., Amsterdam]

A short account is given of three mineral-oil sprays which, when applied before the beet crop emerged, proved effective in clearing the ground of weeds. In the Netherlands, in a triplicated trial on sandy clay, the treatment was applied too early, e.g. immediately after sowing sugar-beet, but nevertheless sugar yields were obtained 3·5 and 7% higher than those of the control plots, which were weeded mechanically and by hand according to normal procedure. In a second trial, made in quadruplicate, on a sandy soil, application of the three oil sprays resulted in increased sugar-yields of 15, 10-19 and 10%, respectively, compared with the untreated plots.—G.M.R.

852 WARREN, L. E. **The control of annual grasses in sugar beets with Dalapon.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8,** Pt. 1, 124–9, bibl. 1. [Dow Chem. Co., Seal Beach, California]

Amounts of 3–5 lb. of the Na salt of Dalapon were effective for controlling *Echinochloa crus-galli* in sugar-beet. The use of a surfactant markedly increased herbicidal effectiveness. Control of *E. crus-galli*, treated at the 1- to 3-leaf stage, when several leaves were present, or when the plants had stooled, was similar. Spray-volume rates ranging from 12·5 to 100 gal. per ac. did not differ in effectiveness. Dalapon treatments had no effect on the sucrose content of sugar-beet. Rates over 4 lb. Na Dalapon per ac., or repeated applications of 4 lb. per ac. or more, reduced root yields significantly in some cases. The degree of ultimate yield reduction in sugar-beet appeared to be conditioned largely by the time between recovery from the effects of Dalapon, and harvest. A wide range of winter and summer annual grasses were similar to *E. crus-galli* in their reaction to Dalapon. Dalapon was most effective against grasses when applied while growth was vigorous, while periods of severe soil-moisture deficiency reduced its effectiveness. Temperatures ranging from 55–100°F. had no effect on the action of Dalapon.—P.J.B.

853 DEEMS, R. E. and YOUNG, H. C. **Black root of sugar beets as influenced by various cropping sequences and their associated mycofloras.** [Abstract] *Phytopathology* 1956, **46,** No. 1, 10.

Qualitative and quantitative assays were made of the mycofloras of soils on which lucerne, oats, maize, sugar-beet and a grass mixture had been grown following 2 successive sugar-beet crops. A significant reduction in organisms (chiefly *Aphanomyces cochlioides*) which produce black-root in sugar-beet was noted following the maize and oat crops.—P.J.B.

854 CORNS, W. G. **Effects of various chemical and cold-hardening treatments on resistance of sugar beet seedlings to freezing.** *Canad. J. Bot.* 1956, **34,** No. 1, 154–8, bibl. 3. [Pl. Sci. Dep., Univ. Alberta, Edmonton]

Either the free acid form or the Na salt of Dalapon and of TCA, and the Na salt of 2,2,3-trichloropropionic acid, effectively increased the resistance to cold of sugar-beet seedlings grown in the dark at 21°C., in solutions containing 4 or 8 ppm. concentrations of these substances. Cold-resistance evaluations were made by exposing the seedlings to −10°C. for short periods. The use of IPC, amino triazole, sodium chloride or trichlorobenzoic acid did not result in increased cold resistance. In trials involving the periodic sampling and freezing of Dalapon-treated, illuminated seedlings during a 24-day period of storage at 6°C., treated plants again showed superior cold resistance compared with untreated controls. Cold-hardening treatments tended to reinforce the capacity of Dalapon to endow cold-resistance upon treated plants. The increases in cold resistance following Dalapon treatment were more variable in illuminated plants than in those grown in the dark.—From author's abstract.

855 HOLST, E. M. and CORMANY, C. E. **A study of the effect of magnesium sulfate on yield**

and sucrose content of sugar beets. *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8,** Pt. 1, 32–5, bibl. 4. [Holly Sug. Corp., Swink, Colo]

Foliar applications of up to 40 lb. $MgSO_4$ per ac. did not result in significantly higher sugar yields than controls.—P.J.B.

856 SIMON, M. La fertilisation minérale de la betterave sucrière. [**Mineral fertilizers for sugar-beet.**] *Publ. tech. Inst. belge Amélior. Better.* 1955, **23,** No. 2, 69–113, bibl. 13. [Inst. Better., Tirlemont, Belgium]

This paper deals comprehensively with the fertilizers used and the methods for application in the cultivation of sugar-beet in Belgium, the country which has the highest incidence of virus yellows in western Europe. The fertilizers considered are N, P, K, Mg, Mn and B. It is estimated that, to produce a yield of 50,000 kg./ha. of roots of sugar-beet, under conditions in Belgium, it is necessary to apply fertilizers, in kg./ha. at the rate of 174 N, 100 P, 240 K and 75 Mg. This is in addition to 30,000 kg./ha. of farm-yard manure or a green-manure crop. Climate and the preceding crop modify the amounts required, especially of N. For example, in a humid summer (1954) less fertilizer is required than in a dry one (1947) ; in 1954, the application of 120 kg./ha. N, instead of the 175 kg. normally required, was sufficient to produce a good yield. In Belgium, sugar-beet is grown successfully after flax or an early crop of winter barley which allows time for a green-manure crop of vetch. When, however, a 3-year ryegrass ley was the preceding crop, there were symptoms of N deficiency, even though 180 kg./ha. N were applied. —D.B.

857 LASKE, P. Reihendüngungsversuche mit Stickstoff zu Zuckerrüben und Getreide. [**Row-manuring trials with nitrogen on sugar-beet and cereals.**] *Z. PflErnähr. Düng.* 1955, **71,** No. 1, 1–9, bibl. 39. [Landw. Hochsch. Hohenheim, Stuttgart-Hohenheim, W. Germany]

Sugar-beet. In 1951 and 1953, years of normal and high rainfall, respectively, row placement of fertilizer gave yield increases over broadcasting of 6·5% and 14·5%, respectively, when the quantity of fertilizer was equivalent to 120 kg. N/ha. or less, but when 160 kg. N/ha. were used there were reduced yields of roots and of sugar. Cereals. Results with wheat and spring barley show that, under the German climate, row application of N fertilizer does not pay because its success is too dependent on the weather in any year.—D.B.

858 THORNE, G. N. and WATSON, D. J. **Field experiments on uptake of nitrogen from leaf sprays by sugar beet.** *J. agric. Sci.* 1956, **47,** Pt. 1, 13–22, bibl. 7, illus. [Rothamsted Exp. Sta., Harpenden]

The leaves of sugar-beet crops were sprayed 6 times in late September and early October with 100 gal. per ac. of a 3% solution of ammonium nitrate or equivalent urea. In 2 experiments about 70% of the N was recovered in the plants in mid-October compared with 40% recovered from applications of the same amounts of fertilizer to the soil at the same times. In a third experiment recovery from similar sprayings with urea solution was less than 40%, but very little N was absorbed from soil dressings. Spraying increased the N per cent of dry matter in all parts of the plants. More than half of the N absorbed was in the leaf laminae, and the rest was equally divided between petioles (including crowns) and roots. Spraying slightly increased the dry-matter yield of the tops, but not of the roots. It reduced the sugar content of the roots by about 1% of fresh weight. The recovery of N in the tops from a single low-volume spraying (12·5 or 25 gal. per ac.) with nearly saturated urea solution was about the same as from repeated high-volume sprayings supplying the same total amount of N. The reverse was the case in the roots.—From authors' summary.

859 PENDLETON, R. A. **Cultural practices related to yields and germination of sugar beet seed.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8,** Pt. 1, 157–60, bibl. 2, illus. [Oregon Agric. Exp. Sta., Corvallis]

In field trials on Chehalis sandy loam in Oregon, the following manurial treatments were made to sugar-beet grown for seed : (a) no manure, (b) 150 lb. N per ac., half as ammonium sulphate and half as sodium nitrate, (c) 300 lb. N, (d) as (c), plus 100 lb. P_2O_5 per ac. in spring, (e) as (d), plus 50 lb. K_2O per ac. at each spring application. The manures were applied as 3 equal side dressings, the first in autumn, when the plants were large enough to cultivate, the second in early April and the third in early May. When the plants had developed several leaves in spring, foliar applications of B and Mo were superimposed on the previous treatments. The N treatments resulted in highly significant seed-yield increases. P treatments did not increase seed yields. The K treatments markedly increased stem stiffness. Both foliar treatments resulted in seed-yield increases. Combined N + P treatments increased the germination of harvested seed from 86·6% for controls, to 93·4%. Clipping the tops of sugar-beet stalks which were 24 in. high resulted in a highly significant reduction in seed yields and seed germination.—P.J.B.

860 LARSON, W. E. **Effect of method of application of double superphosphate on the yield and phosphorus uptake by sugar beets.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954,

8, Pt. 1, 25–31, bibl. 7. [Montana Agric. Exp. Sta., Bozeman]

The results are given of 2 trials carried out in Montana to compare the effect on yield and P uptake of sugar-beet of double superphosphate, (a) broadcast and ploughed-under in autumn, (b) broadcast and disced-in in spring and (c) applied in bands, 2 in. and (d) 5 in. deep in spring. In the first trial, methods (a) and (b) resulted in significantly higher yields than methods (c) and (d); mean root yields where 40 or 80 lb. P_2O_5 were applied by method (a) were 1·1 tons greater than where the same amounts of P_2O_5 were applied by band-placement. Yields where methods (a) and (b) were used were very similar. In the second trial, method (a) resulted in root yields 2·2 and 2·3 tons, respectively, greater than where the P was disced-in in spring, or band-placed. The superiority of method (a) over the others was thought to be due to the fact that it permitted some of the P to be near the soil surface where it promoted early growth, and a large amount to be present at some depth, where moisture conditions were such as to favour its use by the plants at relatively later growth stages.—P.J.B.

861 Hills, F. J. and others. **Response of yield-type versus sugar-type sugar beet varieties to soil nitrogen levels and time of harvest.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8**, Pt. 1, 64–70, bibl. 6. [Univ. California, Davis]

In 2-years' trials at 2 locations in California, a study was made of the response of 2 sugar-type sugar-beet varieties to different N treatments. In trials at Woodland in 1951, two sugar-type varieties, U.S. 35/2 and SL828 and two standard varieties, U.S. 33 and U.S. 22/3 were treated with nil, 80, 160 and 240 lb. N per ac. as ammonium nitrate, applied as side-dressings shortly after thinning. In trials at Davis, the varieties U.S. 22/3 and U.S. 35/2 were used and the treatments were the same. In the trials at Woodland, mean sucrose contents for the 4 varieties in the order given, for all N treatments, were 15·6, 15·2, 15·1 and 14·7%, mean root yields were 17·4, 19·6, 19·5 and 21 tons per ac. and mean sugar yields were 2·7, 2·98, 2·93 and 3·07 tons per ac., respectively. There was a significant interaction between N treatment and variety, mainly owing to the relatively high root-yield response of U.S. 35/2 to the first 80 lb. N increment, compared with U.S. 22/3, and to the failure of U.S. 35/2 to compete at high levels of N treatment. In the trials at Davis, the plots were on soil of high fertility and there was little or no response to the N treatments. At this location, the main effect of heavy N treatments was to lower the sucrose content of the roots and decrease total sugar yields. Sugar yields of U.S. 22/3 harvested on 28 September, 1 November and 13 December averaged 3·6, 4·59 and 4·92 tons per ac. for all N treatments; for U.S. 35/2 harvested on the same dates, mean sugar yields were 3·42, 4·1 and 4·41 tons per ac., respectively. At all harvest dates and rates of N treatment, the sugar yields of U.S. 22/3 were greater than those of U.S. 35/2; the superiority of U.S. 22/3 over U.S. 35/2 increased most markedly during October, a time of rapid growth. U.S. 35/2 appeared to be less efficient photosynthetically than U.S. 22/3; sugar storage in U.S. 35/2 appeared to take place at the expense of top- and root-growth.—P.J.B.

862 Hogaboam, G. J. and others. **Stand and yield of sugar beets, and weed populations as affected by: broadcast fertilization, mechanical thinning, application of herbicides and their interactions.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8**, Pt. 1, 95–105, bibl. 1. [Michigan Agric. Exp. Sta., East Lansing]

The trials reported were carried out in Michigan, using the variety U.S. 400. Treatments used included 500, 1000 or 2000 lb. 3-18-9 (NPK) manure per ac., applied before sowing, three different thinning treatments, post-emergence herbicidal treatment with mixtures of 5 lb. Na TCA + 2 lb. Endothal in 30 gal. water per ac., or pre-emergence treatment with mixtures of 5 lb. TCA + 2 lb. Na PCP in 40 gal. water per ac. The herbicides were applied in 6 in. bands over the rows. The pre- and post-emergence treatments resulted in root yields of 9·68 and 8·87 tons per ac., with 3029 and 2749 lb. sucrose per ac., respectively, compared with root yields of 9·19 and 10 tons per ac. and sucrose yields of 2909 and 3190 lb. per ac., respectively, where the crops were not treated. The pre-emergence treatments gave excellent control of grasses at the time of emergence of the sugar-beet and their effects continued for about one month. Control of broad-leaved weeds was relatively much less effective. The post-emergence treatments resulted in good control of broad-leaved weeds, but reduced yields significantly. The herbicidal treatments resulted in a significant reduction in sucrose content and purity coefficients. Combined pre- and post-emergence treatments appeared to be merely additive in their effects. Pre-emergence treatments reduced plant stands, but final yields were significantly increased.—P.J.B.

863 American Society of Sugar Beet Technologists. **Proceedings of the 8th General Meeting.** 1954, **8**, Pt. 1, pp. 389.

Investigations reported:

1. Effect of method of application of double superphosphate on the yield and phosphorus uptake by sugar beets. By W. E. Larson, pp. 25–31. [See Abs. 860.]
2. A study of the effect of magnesium sulfate on

yields and sucrose content of sugar beets. By E. M. Holst and C. E. Cormany, pp. 32–5. [See Abs. 855.]
3. Response of sugar beets to nitrogen fertilizer in the Imperial Valley, California. By A. Krantz and A. J. Mackenzie, pp. 36–41. The effect of N manure on leaf petiole composition and root yield and quality was studied under 3 widely varying fertility levels.
4. The effect of fertilizer treatments upon yield and sugar content of sugar beets at Garden City, Kansas. By C. W. Carlson and R. B. Herring, pp. 42–6. Plant tissue tests appeared to be a good index of which soils would respond to applications of N, but not P.
5. The application of petiole analyses to sugar-beet fertilization. By D. Ririe and others, pp. 48–57.
6. Response of yield-type versus sugar-type sugar beet varieties to soil nitrogen levels and time of harvesting. By F. J. Hills and others, pp. 64–70. [See Abs. 861.]
7. Cropping and fertilizer practices for the production of sugar beets in Western Nebraska. By H. F. Rhoades and L. Harris, pp. 71–80.
8. The fertility balance in a ten-year sugar beet rotation after 42 years of cropping. By S. Dubetz, pp. 81–5.
9. Stand and yield of sugar beets, and weed populations as affected by: broadcast fertilization, mechanical thinning, application of herbicides and their interactions. By G. J. Hogaboam and others, pp. 95–105. [See Abs. 862.]
10. Sugar beet irrigation experiments in Wyoming. By W. M. Miller and others, pp. 112–19. In the trials reported, no sugar beet yield reductions resulted from soil moisture tensions ranging up to 4 atm. at the 6 in. soil depth.
11. The control of annual grasses in sugar beets with Dalapon. By L. E. Warren, pp. 124–9. [See Abs. 852.]
12. Grass control in sugar beet with the herbicides IPC, TCA and DCU. By R. T. Nelson, pp. 130–4.
13. Influence of Krilium soil conditioner on sugar content of beets. By C. H. Smith, pp. 143–6.
14. Estimate of space occupied proposed as a measure of sugar beet stands. By G. W. Deming, pp. 151–6. A proposal is made that the space actually occupied by sugar beet plants in machine-thinned stands should be used as a measure of the populations of such stands.
15. Cultural practices related to yields and germination of sugar beet seed. By R. A. Pendleton, pp. 157–60. [See Abs. 859.]
16. Sugar losses caused by frost defoliation. By F. H. Peto, pp. 171–5. [See Abs. 850.]
17. The influence of maleic hydrazide on bolting and yield of over-wintered sugar beets in California. By D. Ririe and others, pp. 176–82. Where foliar sprays of MH were applied to sugar beet sown in May or August, for harvest the following spring, bolting was reduced and delayed and sugar contents in the roots increased in all cases where the MH was applied before visible evidence of bolting was present.—P.J.B.

FODDER-BEET

864† Blackett, R. D. **Dry-matter distribution in the fodder-beet root.** *Emp. J. exp. Agric.* 1955, No. 91/2, 202–5, bibl. 3, illus. [Univ. School Agric., King's Coll., Newcastle upon Tyne]

The dry-matter distribution was studied in roots of the fodder-beet varieties Hunsballe X, Red Øtofte, Barres Øtofte (high, intermediate and low dry-matter groups, respectively). Marked variations in dry-matter distribution within the roots were related to ring density, the dry-matter being high towards the outside and the tip of the root. Ring density in these regions is also high. There was also variation between varieties and to a less extent within individual roots of a variety. The size of this latter variation indicated that at least 20 roots should be sampled. Sampling by the diagonal core method is best, but horizontal cores may be useful for rather long and narrow roots.—M.P.

POTATOES

865 Dyke, G. V. **The effect of date of planting on the yield of potatoes.** *J. agric. Sci.* 1956, **47,** Pt. 1, 122–8, bibl. 26, illus. [Rothamsted Exp. Sta., Harpenden]

Evidence obtained in the Agricultural Improvement Council Survey of Maincrop Potatoes 1948–51 and in experiments shows that yields in England and Wales are decreased by delay in planting after about 11 April at the rate of about 0·4 tons per ac. per week. The effect is rather greater in years with fine springs, and on high-yielding fields. The potential increase in national production if all fields were planted by 11 April is equivalent to about 0·5 tons per ac., or 5% of the total production. In Rothamsted experiments the responses to dung and fertilizers were all greatly reduced when planting was delayed. The evidence on the responses of different varieties to early planting in English experiments is contradictory, except for an indication that higher yielding varieties respond better. Data from Craibstone suggest that, if bulk yield is the only criterion, 'early' varieties which make rapid growth early in the season have a later optimum planting date than maincrop varieties. Chitting seed at Craibstone increased yields by 1·7 tons per ac. for March plantings, and by 2·4 tons per ac. for plantings in mid-April and later. There was negligible loss of yield from sprouted

eed at Craibstone for plantings delayed up to mid-pril, but for unsprouted seed there was evidence f a gain from plantings a month earlier. Sprouted eed planted even as late as 1 May yielded as well s unsprouted planted 2 months earlier.—From uthor's summary.

866 ZÁBORSKÝ, J. Agrotechnické pokusy so zemiakmi. [**Cultural experiments in the growing of potatoes.**] *Pol'nohospodárstvo* 1955, **2,** No. 2, 11–23, Russian and German summaries.

fter discussing the usual methods of cultivation, nanuring and after-care in the growing of potatoes, he author describes experiments relating to plant-ng time. Results obtained by the usual planting n spring are compared with data from summer lanting (late June-early July). Summer planting f potatoes might be of some importance after vinter catch crops, early-ripening corn, rape seed or oil production, and, more particularly, after a are fallow. Four varieties were used and all but ne showed a marked decrease in yield (16–32%) ollowing summer planting. One variety, however, howed an increase in yield of 9%. Summer lanting proved superior to spring planting in egard to tuber quality and size, so that this ethod may prove of importance for the produc-ion of seed potatoes. Further trials of summer lanting following bare fallow and different crops winter dredge corn, winter barley, rape seed, rimson clover, summer dredge corn, mustard and pinach), showed that the highest yields were chieved after spinach and crimson clover, but the uality was such that the resulting crop could not e used for seed purposes. After bare fallowing, a igh-quality crop was obtained but the yield was uantitatively disappointing.—F.P.

867 POLERECKÝ, O. Význam krájania zemiakov v kukuričnej výrobnej oblasti. [**The use of cut setts of potatoes in maize-growing regions.**] *Pol'nohospodárstvo* 1955, **2,** No. 2, 97–112, illus., Russian and German summaries.

o achieve the highest possible yields of potatoes, eed pockets, containing 2 tubers each, should be lanted 24–28 in. apart in rows which are also 4–28 in. distant. It has been assumed that an ncrease in the number of seed pockets might pro-uce a more uniform crop and a higher yield per cre, but, as this should be achieved without a orresponding increase in the weight of seed used, he use of cut setts is advocated. Experiments ere arranged with the varieties Erstling and riumph to compare the yields from tubers cut in ifferent ways and from cut and whole seed. rstling responded to cutting with a yield increase p to 25% if planted in 24 in. squares and up to 0% if planted in 28 in. squares. An increase in the starch content was also recorded (0·05–0·55%). The variety Triumph reacted differently ; planted in 24 in. squares only a slight increase in starch content was obtained but there was no increase in yield. Planted in rows 25 in. distant, with the seed pockets 16 in. apart, cut tubers out-yielded whole tubers by 22–36% and the starch yield per acre increased by 21–38%. It is stressed, however, that a major yield increase can be expected only if the total weight of cut seed tubers is not less than the weight of the uncut seed per acre. It is important to disinfect the knives used for cutting the tubers, otherwise virus infections are bound to occur.—F.P.

868 SCHACHTSCHABEL, P. Die optimale Bodenreaktion im Kartoffelbau. [**The best soil reaction for potato cultivation.**] *Kartoffelbau* 1956, **7,** No. 1, 4–5, bibl. 8. [Techn. Hochsch. Hannover, W. Germany]

In a loamy sandstone soil, the highest potato yields are obtained from a soil of pH 6·0–6·5, so long as the Mn content is adequate. On a sandstone soil which is rich in humus and poor in clay and Mn the optimal soil pH is 5·5–6·0.—D.B.

869 RIGOT, N. Les obtentions belges en pommes de terre. [**Belgian varieties of potato.**] *Rev. Agric., Brux.* 1955, **8,** No. 10, 1290–7. [Sta. Rech. État Amélior. Pomme de Terre, Libramont, Belgium]

Descriptions are given of 5 new varieties of potato, Cresus, Dalila, Electre, Eschyle and Erato, which have been produced at the above experiment station. The following comments are made regarding these varieties. Dalila has an excellent flavour and is more productive than Rosa, the variety with which it should be compared. Electre is later than Eigenheimer. Eschyle, like Erato, requires a good soil and is drought resistant. It grows best in the midlands of Belgium. Eschyle is particularly resistant to potato scab and potato rot. It is a good floury potato.—D.B.

870 TANO, K. and KOBAYASHI, M. **Studies on the abnormal sprouting of seed potatoes and its artificial induction.** [Japanese] *J. hort. Ass. Japan* 1955, **24,** No. 3, 181–8, bibl. 8, English summary.

A study was made of the mechanism of abnormal sprouting of potato tubers, whereby small tubers, instead of normally-elongating sprouts, are formed. Factors favouring this type of abnormality included : inhibition of sprout elongation, low numbers of healthy sprouts, damage to terminal buds, unfavourable storage conditions, and the physical resistance of soil to sprouting. Varieties were classed as follows : those with frequent abnormal sprouts, Benimaru, Pawnee, Shimakei No. 30, Menominee and Triumph ; those with

medium incidence, Irish Cobbler and 529–1 ; those with low incidence, Chitose, Norin No. 1 and Norin No. 2 ; those having no tendency to form abnormal sprouts, Hokkai No. 1, Hokkai No. 2 and Kennebec. Varieties with relatively slender sprouts showed a tendency to form abnormal sprouts and this condition could be induced by treatment with potassium indole acetate.—From authors' summary.

871 FINK, H. C. and others. **Potato seed piece treatments in Pennsylvania in 1955.** *Pl. Dis. Reptr* 1956, **40,** No. 2, 125. [Pennsylvania State Univ., University Park]

In the trials reported, 1-minute dips in streptomycin and fungicides, either alone or in combination, were used at the following rates : 100 ppm. streptomycin, 1 lb. Spergon, 2 lb. Phygon and 1 lb. Captan per 20 gal. water ; 1 pt. Nabam per 30 gal. water ; dusts containing 10% Ferbam + 1% streptomycin. In almost all cases, stands and yields were increased by the treatments ; blackleg (*Erwinia carotovora*) was not prevalent in these trials.—P.J.B.

872 SELMAN, I. W. and SCHIMMER, F. C. **Disease incidence and yield variation in potatoes grown for five years with organic and inorganic fertilizers.** *Emp. J. exp. Agric.* 1955, **23,** No. 91/2, 226–33, bibl. 10, illus. [Wye Coll., Univ. London]

The variety King Edward VII was grown continuously for 5 seasons using " seed " saved from the same plot in the previous year. The manurial treatments, compost, inorganic fertilizers, and half compost and half inorganic fertilizers, were compared. Observations of pest and disease attack were made during growth and at harvest. With blight (*Phytophthora infestans*), in all years but the first, and with the other pests and diseases and viruses in all years, the treatment differences were not significant. With inorganic fertilizers and the half-and-half treatment, yield was significantly correlated with the rain that fell during the 4-week period that included 1 week before the first shoot appeared and 3 weeks thereafter. With all treatments, yield was significantly correlated with the maximum stem-height.—From authors' summary.

873 GIBSON, K. E. **Cultural practices affecting wireworm injury to potatoes.** *J. econ. Ent.* 1956, **49,** No. 1, 99-102, bibl. 4. [Washington]

In field-plot experiments carried out at Walla Walla, more wireworms (mainly *Limonius canus*) were found in the soil as the season advanced. Reduction in irrigation water tended to reduce wireworm injury to potatoes but also reduced the value of the crop. Injury was progressively less as the sowing date was delayed, particularly to 20 June or later.—From author's summary.

874 MÜNSTER, J. Possibilités d'application d précontrole cultural des plants de pomme de terre en Suisse. [**The possibility of applying the pre-cultivation test to seed potatoes in Switzerland.**] (*Publ. 416. Sta. fed. Essai Agric., Lausanne*) *Landw. Jahrb. Schwei* 1955, **69,** No. 7, 741–51, bibl. 8, illus.

Certified seed of 7 varieties of potato were teste for health, between harvest and sale, by breakin their dormancy with Rindite, then standing 1 hr in an 8% solution of ammonium sulphocyanide planting the tubers, and making observations o disease symptoms. This so-called Florida test i scarcely applicable in Switzerland because of th possibility of early frosts in September and Octobe even in Tessin and in the region round Lak Geneva. Only those potatoes grown for seed a 600–800 m. altitude, which are harvested i August, could be tested in this way.—D.B.

875 HOGMAN, W. G. **Potato seed treatments with Agri-mycin 100 and other materials.** *Bimon. Bull. N. Dak. agric. Exp. Sta.* 1956, **18,** No. 3, 96–7.

The results are given of trials on the use of a number of fungicidal treatments made to Sebago potato seed-pieces for the control of blackleg. The acid mercury dip was the most effective fo reducing blackleg incidence, but was injurious t the seed. Agri-mycin dips and dusts (200 ppm.) were nearly as effective as the acid mercury dip and resulted in considerable tuber-yield increases ove untreated controls.—P.J.B.

876 VICENTE J., R. Influencia de la temperatura de germinación en la manifestación del fenómeno de bacteriostasia natural de la patata. [**Influence of the temperature of germination on the manifestation of the phenomenon of natural bacteriostasis in the potato.**] *An. Edafol. Fisiol. veg.* 1955, **14,** No. 9–10, 519–38, bibl. 10, illus., English and French summaries.

877 GILLES, A. and DEVREUX, M. Recherches cytogénétiques sur les *Solanum*, section *Tuberarium*. 2. Pollinisation et fécondation. [**Cytogenetical researches on *Solanum*, section *Tuberarium*. 2. Pollination and fertilization.**] *Agricultura, Louvain* 1955, **3,** No. 4, 451–60, bibl. 4, illus. [Univ. Louvain, Belgium]

The time interval between pollination and fertilization in *Solanum tuberosum* was determined by following, in transverse and longitudinal sections, the progress of the pollen tube down the style. In short-styled flowers (5–6 mm.) this time interval was 20 hr. ; in long-styled flowers (8–10 mm.) it was 24 hr.—D.B.

878 VIDÉKI, L. Új módszer a burgonyafehérje gyors meghatározására. **A new method for the quick determination of protein in potato.** *Növénytermelés* 1955, **4,** No. 4, 333–6, bibl. 6, illus., Russian and English summaries.

From the homogeneous potato pulp prepared from a sample weighing about 0·5 kg., the water was extracted with anhydrous sodium sulphate, and from the resulting water-free potato meal the protein was then dissolved with alkaline alcohol (2% sodium hydroxide dissolved in 50% alcohol). The protein obtained was centrifuged and a known amount of the pure solution titrated. Because of the colour change taking place after titration, while standing, it was found necessary to titrate at room temperature (about 20°C.) within 5 to 10 min. The new method appears to be more suited for serial tests than other titration methods, for it takes less time (40–50% less than Schwarze's method), does not require expensive trichloroacetic acid, and yields sufficiently exact and reproducible results. The extinctions were measured with a Pulfrich photometer.—From author's summary.

879 SHAW, T. M. and ELSKEN, R. H. **Moisture determination. Determination of water by nuclear magnetic absorption in potato and apple tissue.** *J. agric. fd Chem.* 1956, **4,** No. 2, 162–4, bibl. 5. [West. Utiliz. Res. Br., Agric. Res. Serv., U.S. Dep. Agric., Albany, California]

The measurement of the nuclear magnetic resonance absorption of hydrogen nuclei in water provides a rapid method for the determination of the water content of potato tissue without reference to other standard procedures. The results agree well with those obtained by the vacuum-oven method. —From authors' summary.

880 MULDER, E. G. **Effect of mineral nutrition of potato plants on respiration of the tubers.** *Acta bot. néerl.* 1955, **4,** No. 3, 429-50, bibl. 28, illus. [Agric. Exp. Sta., and Soil Res. Inst., T.N.O., Groningen, Netherlands]

The results are given of field trials to determine the effect of nutrient deficiencies of N, P, K, Cu and Mg on the respiration of potato tubers.—P.J.B.

881 HILL, H. and others. **Phosphorus content of potato plants in relation to yield and to phosphorus concentrations in nutrient solutions.** *Canad. J. agric. Sci.* 1954, **34,** No. 6, 644–50, bibl. 8, illus. [Hort. Div., Canada Dep. Agric., Ottawa]

The relationship between the P content of the potato plant and tuber yield was studied in sand pot-culture experiments in the greenhouse. Determinations of the total P content of the leaf blades provided the best index for relating tuber yields to the P content of the plants. It was estimated that the P content of the leaf blades of adequately nourished potato plants should not be below 0·35%.—From authors' summary.

882 SCHMITT, L. and BRAUER, A. Grundsätzliches zur Düngung von Kartoffeln. [**Some fundamentals in the manuring of potatoes.**] *Kartoffelbau* 1956, **7,** No. 1, 1–4, illus. [Landw. Versuchsanst., Darmstadt]

The fertilizer requirements of the potato crop are discussed, giving attention to quantity, the form in which the element is applied to various types of soils and the time of application. In addition to farm-yard manure or a leguminous green manure, N, P and K are required in the following amounts : nitrogen at the rate of 80 kg. N/ha. and applied as $(NH_4)_2SO_4$ except in strongly acid soils, or N can be given in two instalments, half as a quick-starting N and half later as calcium cyanamide for weed control ; phosphorus at the rate of 100–120 kg. P_2O_5/ha. as Thomas slag for lime-containing soils ; and potassium at the rate of 100–160 kg. K/ha. K should be given as K_2SO_4 rather than as KCl because the chloride results in a lower starch content and lower resistance to the leaf aphid. In Hesse, the average yield increase from 1 kg. N is 90 kg., from 1 kg. P_2O_5 is 31 kg., and from 1 kg. K is 11 kg. potato tubers. Lime is but seldom needed since the potato tolerates acid soils. On the north German plain and in other parts of the country there is evidence of magnesium deficiency which can be remedied with dolomite or other magnesium-containing minerals according to the properties of the soil.—D.B.

883 BÄDEN, W. Die Kaliphosphatdüngung zu Kartoffeln auf Hochmoor und Heidekulturen. [**Potassium phosphate fertilizers for potatoes on moss [bog] and heathland.**] *Kartoffelbau* 1956, **7,** No. 1, 11–15. [Staatl. Moor-Versuchsstat., Bremen, W. Germany]

On these soils so rich in humus, potatoes can be cultivated without either farm-yard manure or green manure, so long as there is a plentiful supply of K and P fertilizers during the first 2 cropping years to ensure a high yield of tubers with a good starch content. Tables give the effect of these fertilizers on yield and starch content of tubers. 200 kg. K_2O/ha. and 150 kg. P_2O_5/ha. are advised for newly cultivated land, the quantities being reduced as the potatoes come within the normal crop rotation.—D.B.

884 GREEN, H. C. **Potato damage.** *J. agric. engng Res.* 1956, **1,** No. 1, 56–62, bibl. 1. [N.I.A.E., Silsoe, England]

The main types of damage found in harvested potatoes were examined. Split potatoes, also wounds and bruises, can be caused by the potatoes

falling ; damage increased rapidly with heights over 2 ft. Cuts are mainly caused by the share and skinning by the digger chains and spinner tines.—C.L.S.

885 EMILSSON, B. and others. Användning av groningshämmande medel vid lagring av matpotatis. III. Forsök under Lagringssasongerna 1952–53 och 1953–43. [**The use of sprout-inhibiting chemicals in the storage of ware potatoes. 3. Experiments during the storage seasons 1952-3 and 1953-4.**] *K. LantbrAkad. Tidskr., Stockh.* 1955, **94,** No. 2–3, 141–58, bibl. 27, English summary.

A dosage of 2500 g. maleic hydrazide per ha. applied to potato crops before lifting nearly always inhibited sprouting to a satisfactory degree ; increasing the dosage to 5000 g. per ha. completely inhibited it, in most cases. Spraying with MH 2 weeks before lifting was less effective than spraying 4 or 6 weeks before lifting. On an average, weight loss in the MH-treated lots was a little, and in a few cases considerably, greater than in untreated lots. Only in some exceptional cases did MH treatment result in loss through diseased tubers. MH treatment is not recommended for general use in potato-growing in Sweden. Of other preparations studied, isopropyl-phenylcarbamate (IPC) appeared to have a sprout-inhibiting activity about ten times as great as that of tetrachloro-nitrobenzene (TCNB), while dinitrotoluene (DNT) appeared to have a somewhat greater activity than TCNB.—From authors' summary.

SWEET-POTATOES

886 HYCHE, L. L. and EDEN, W. G. **Effect of formulations and methods of application of insecticides on the control of wireworms** [***Conoderus* spp.**] **on sweet potatoes.** *J. econ. Ent.* 1956, **49,** No. 1, 111–13, bibl. 5. [Alabama Agric. Exp. Sta., Auburn]

887 FLOYD, E. H. **Control of the sweetpotato weevil and several insects attacking roots of sweet potatoes in the field.** *J. econ. Ent.* 1955, **48,** No. 6, 644–8, bibl. 1. [Louisiana Agric. Exp. Sta., Baton Rouge]

The results from 11 field trials carried out during 1941–54 showed that calcium arsenate dust, applied at the rate of approximately 10 lb. per ac. at weekly intervals for 8 weeks beginning approximately 10 days after the slips were set in the field, gave significant control of the sweet-potato weevil (*Cylas formicarius elegantulus*). Chlordane and Aldrin gave considerable protection to the roots from damage by the sweet-potato weevil and other insect pests.—E.B.O.

OTHER

888 IRVING, H. **Fertilizer experiments wit yams in Eastern Nigeria 1947-51.** *Trof Agric., Trin.* 1956, **33,** No. 1, 67–78, bibl. 5

The experimental programme on fertilizers for th yam crop over the 1947–51 period is describec Various problems arising from out-station exper ments in undeveloped country with poor com munications are discussed. In general, there is marked response to nitrogen, and also to potas but at a much lower order, throughout the regior There is not a general response to phosphat throughout the region but in certain areas ther are definite positive trends.—Author's summary

889 SCHMITT, J. Cultivo abundante y explo tación industrial de la yuca. [**Growin cassava for industrial use (in Costa Rica).** *Suelo tico* 1955, **8,** No. 34, 152–8, bibl. 6 illus.

An account is given of manurial trials with cassav [*Manihot* sp.], carried out in various countries.— E.B.O.

GENERAL

890 IVERSEN, K. and DORPH-PETERSEN, K Forsøg med stigende maengder kvael stofgødning til rodfrugt ved anvendelse a forskellige maengder staldgødning og ajle [**Experiments with nitrogenous fertilizer applied to root crops in increasing dose combined with varying amounts of farm yard manure.** *Tidsskr. Planteavl* 1955, **59** No. 3, 433-63, English summary.

Trials in applying N together with farmyar manure were conducted in Denmark on light loar and sand from 1948 to 1954, 20 being concerne with beet-growing, 12 with swedes and 12 wit potatoes. Results are described and discussed entirely from the economic viewpoint.—G.M.R.

FIBRE CROPS

COTTON

891 BROWN, L. C. and HYER, A. H. **Chemica defoliation of cotton : 5. Effects of pre mature defoliant and desiccant treatments o boll components, fibre properties, germina tion, and yield of cotton.** *Agron. J.* 1956, **48** No. 2, 50–5, bibl. 8. [Fld Crops Res. Br. Agric. Res. Sta., U.S. Dep. Agric., Sacaton Arizona]

Three randomized block experiments were con ducted : (1) using 2 chemical defoliants, S.E.X (sodium ethyl xanthate, 85%) and Shed-A-Lea

dium chlorate, 40%), at rates of 7 lb. per ac., plied to either the lower two-fifths or four-hs of plants with bolls under 35 days old ; (2) plying 7 lb. of Shed-A-Leaf per acre to the lower o-fifths or four-fifths of plants with either ture (over 35 days old) or immature bolls ; and , similar to experiment (2), except that a desic-nt, Golden Harvest (pentachlorophenol, 40%) s diluted, 1 to 10, with No. 2 diesel fuel and then plied at the rate of 8 gal. per ac. It was shown at premature treatments, in which bolls were s than 35 days of age, resulted in the following eterious effects : (a) reduction in boll size, mber of seeds per boll, and the seed- and lint-dex ; (b) an increase in fibre fineness in most, t a decrease in the upper-half mean length and al mean length of the fibres in some experi-nts ; (c) reduction in germination percentage ; d (d) reduction in yields. No damage was parent when chemicals were applied to portions plants in which bolls were at least 35 days old.—M.G.

2 KILLOUGH, D. T. and others. **Performance of cotton varieties in Texas, 1951-53.** *Bull. 788. Texas agric. Exp. Sta.* 1954, pp. 13. [Received July, 1955]

ta are given on the performance of cotton rieties during the second 3-year period of the ate-wide cotton varietal evaluation programme Texas. The results are divided into three main oups : (a) the Lower Rio Grande and Trans-cos regions, (b) the High and Rolling Plains ions and (c) the Central, Coastal and Eastern ions. Nine varieties were tested on a State-wide sis. Average yields of lint were headed by Hi-ed, with 329 lb. per ac., followed by Deltapine PSA, Stormproof 1, Empire Watson and Lockett), with 322, 316, 308 and 306 lb. per ac., respec-ely. Yields in region (a), where all crops were wn under irrigation, were headed by Acala 17C, Deltapine TPSA, Acala 4–42 (Calif.) and neville TPSA, with an average of 998, 982, 913 1 897 lb. lint per ac., respectively. In region (b) 3 locations under irrigation and 4 under dryland ditions, highest yields were given by Paymaster Hi-Bred, Deltapine TPSA and Stormproof . 1, with an average of 316, 285, 271 and 267 lb. t per ac., respectively. In region (c) under dry-d conditions, highest average yields were given D & PL Fox, Hi-Bred, Deltapine TPSA and rmproof No. 1, with 370, 351, 348 and 341 lb. t per ac., respectively. Varieties are recom-nded for different regions in Texas.—P.J.B.

HAMEED, A. and KARIMULLAH. **The chemistry of germination of seeds. 1. Cotton-seed.** *Pakist. J. sci. Res.* 1955, **7,** No. 4, 170–1, bibl. 7. [Univ. Inst. Chem., Lahore]

894 LAWES, D. A. **A note on the effect of 2,4-D weedkiller on cotton.** *Emp. Cott. Gr. Rev.* 1955, **32,** No. 4, 274–5, bibl. 2. [Dep. Agric. Fm, Kano, Nigeria]

The extreme sensitivity of cotton to 2,4-D, especially the ester form, and the danger of using it anywhere in the vicinity of cotton crops are indicated. Abnormal vegetative growth and the lowering of cotton yields were observed as a result of the 2,4-D ester weedkiller used in the locality, but not on the farm itself, for the control of the weed *Acanthospermum hispidum.*—P.M.G.

895 NORMAND, W. C. **Studies of some effects of herbicides on cotton.** *Diss. Abstr.* 1955, **15,** No. 11, 1989. [Louisiana State Univ.]

In field and greenhouse tests, 13 cotton varieties were treated with the following pre-emergence herbicides : DNOSBP alkanolamine salt, CIPC, CMU and Karmex D (3(3,4-dichlorophenyl)-1, 1-dimethylurea). No differences were noted between the varieties in response to these herbicides. The effect of CMU on some physiological processes in cotton was studied.—P.J.B.

896 CALCAGNOLO, G. and SAUER, H. F. G. A influência do ataque dos pulgões na produção do algodão (*Aphis gossypii* Glover 1876, Hom. Aphididae). [**The influence of aphid (*Aphis gossypii*) attack on cotton yield.**] *Arq. Inst. biol.* 1952–4, **21,** 85–99, illus., English summary. [Inst. Biol., São Paulo, Brazil] [Received Feb., 1956]

In 2 trials on the chemical control of aphids on cotton, yields from the untreated controls were 44 and 47% lower than from the respective plots treated with Parathion. In the second trial, carried out on larger plots than the first, treatment with Parathion 0·01% consisted of 3 sprays applied at the rate of 400 l. per ha.—E.B.O.

897 CALCAGNOLO, G. and SAUER, H. F. G. Novos resultados no combate ao ácaro do algodoeiro (*Eotetranychus telarius* (L). [**New results in the control of the spider mite (*Eotetranychus telarius*) on cotton.**] *Biológico, S. Paulo* 1955, **21,** No. 10, 173–84, bibl. 6.

Of the acaricides tested, Systox 0·03% emulsion spray and Ovotran 0·6% wettable dust were best and gave effective control. Three treatments were given, the first at the beginning of the attack, the second 10–15 days from the first, and the third 20–25 days later. [See also Abs. 539.]—E.B.O.

898 JOYCE, R. J. V. **Some observations on the effect of insecticides on the growth of cotton plants.** *Emp. Cott. Gr. Rev.* 1955, **32,** No. 4, 266–73, bibl. 3. [Res. Div., Minist. Agric. Gezira, Sudan]

Contrary to prevailing opinion, DDT did not delay

fruiting of cotton sprayed 6 times between 1 October and 30 November. Each spray treatment contained 1 lb. of active ingredient per feddan. The jassid population on the unsprayed plot was extremely light, thus isolating the effect of the spray. Under these conditions DDT spray increased leaf size and number of leaves per plant and even advanced fruiting of the crop. While Parathion spray at the rate of 0·25 lb. per feddan did not increase vegetative growth, there was a significantly greater number of open bolls in January on sprayed than on unsprayed plots, due perhaps to a 50% reduction of whitefly [*Bemisia gossypi-perda*] population resulting from Parathion spraying.—P.M.G.

899 TARR, S. A. J. **Seed treatment against blackarm disease of cotton in the Sudan. 4. Recent research on wet treatments.** *Emp. Cott. Gr. Rev.* 1956, **33,** No. 2, 98–104, bibl. 2.

Per unit of mercury the organo-mercurial compound R1489 (methoxyethylmercuriacetate MEMA) was more effective than mercuric chloride-iodide in control of blackarm disease, *Xanthomonas malvacearum*, carried by cotton seed. Wet methods of seed treatment were more effective than powders. A short-wet treatment [lasting 10 min.] applying 50 c.c. of MEMA solution per lb. of seed to give 0·043% mercury/seed was as effective as steeping for 2 hr., except with very heavily infected seed for which the mercury/seed load should be increased to about 0·086%. With 0·043% mercury/seed, steeping for 2 hr. was necessary for efficient disinfection, but with 0·086% mercury/seed, shorter periods were satisfactory. The practical difficulties involved in steeping large quantities of cotton seed are discussed and it is recommended that the MEMA short-wet method described above should replace the mercuric chloride-iodide powder treatment at present used.—Author's summary.

900 MCILRATH, W. J. **Cotton stem intumescences as a result of flooding.** *Pl. Dis. Reptr* 1956, **40,** No. 1, 65–7, bibl. 13, illus. [Univ. Chicago, Illinois]

Seedlings of Stoneville 2B cotton were flooded to a depth of 3 in. by tap water when 18 days old. Intumescences appeared on the stems within 6 days and extensive bark rupturing had occurred after 14 days. Reduced light intensities had little effect on the production of these abnormalities. Growing the plants for 3 months in an atmosphere of 100% relative humidity, but with normal soil-moisture conditions, produced no abnormalities. Stem intumescences appeared below water level, only, and also appeared where the stems, but not the roots, were flooded. These growth abnormalities were ascribed, not to the water itself, but to abnormal metabolism in the stems, possibly the result of restricted gaseous diffusion in and out of the stems. In 54-day-old plants, intumescer could be produced only in relatively new grow There were varietal differences in the degree stem intumescence produced by flooding.—P.J

901 ZUNINO, H. A. Porcentaje de cruzamie libre en el cultivo del algodonero. [**centage of free crossing in cotton cultivati** *An. Soc. cient., Argent.* 1954, **157,** No. 4 55–61. [Received Feb., 1956]

Results from a plot trial, in which 2 types of cot plants, differing in a dominant character, w grown in alternate rows, indicated that the p centage of crossing was 7·9. This cross-pollinat was due to insect activity, the effect of wind be almost nil. Another trial, in which these 2 type cotton were grown at different distances ap indicated that the greatest distance at which cr ing took place was 51 m. on the south side of field with 0·1% crossing. On the north side, crossing was observed at a distance of 15 m E.B.O.

902 GOODMAN, A. **The effects of leaf, bud fruit pruning upon X1730A cotton at Tok Sudan.** *Emp. Cott. Gr. Rev.* 1956, **33,** No 24–34, bibl. 19.

Leaf, bud and boll pruning experiments w carried out on X1730A cotton plants unprotec against insect attack at Tokar. Plants from wh leaves were removed earlier than five to six we before the end of picking did not yield as well unpruned controls. Before that time, leaf prun progressively reduced yield in proportion to ea ness and extent of defoliation. Despite the non loss by shedding associated with insect damage a physiological causes, additional bud pruning 1 : 8 in December and 1 : 4 bolls in Janu increased the numbers of open bolls harves from pruned plants as compared with cont Plants which lost half their small bolls in Janu yielded as well as controls. In view of this evide it is concluded that bud and boll feeding inse at Tokar were not, in this season, of econo importance in reducing crop yield. Other lev of bud, boll and leaf pruning reduced yields exc at the end of the season.—Author's summary.

903 DARK, S. O. S. **Hormone treatment to p vent shedding of breeding cotton bo** *Emp. Cott. Gr. Rev.* 1955, **32,** No. 4, 277– [Wad Medani and Shambat, Sudan]

The shedding of cotton flowers under Sudan c ditions can be prevented by painting the calyx a inner surface of the bracteoles at pollination t with a 1000 ppm. solution of α (2,4,5 trichlo phenoxy) propionic acid as the sodium salt distilled water plus a wetting agent. For spe circumstances and conditions, the hormone ap cation can be varied in concentration up to

st 2000 ppm. without injury, and in frequency m a single to weekly or fortnightly applications ntinued until maturity is reached.—Author's nmary.

4 Mošков, B. S. [**The effect of the intensity and duration of illumination on growth and development of plants.**] [Russian] *Fiziol. Rast.* (*Pl. Physiol., USSR*) 1955, **2**, No. 6, 539–48, bibl. 14, illus. [Agrophysical Sci. Res. Inst., All-Union Acad. Agric. Sci., Leningrad]

e productivity of every photosynthesizing plant pends on the magnitude of the light energy it eives. This determines, initially, the plant's y weight and ultimately the yield of fruit and d. The author's study is concerned with deter- ning the optimal radiant energy required by nts per day by means of growing the early ening Odessa 7 variety of *Gossypium* sp. (among ier species) under artificial irradiation. Cotton is e of the most " photophilous " crops, yet ex- sure of the plants during 15 days to radiation rying between 100 (= 0·1 of the sun's mid-day umination) and 1000 watts/m.^{2} showed that dry ight rose from 0·38 g./plant with 100 w. to a ximum of 1·96 g. with 400 w., after which the y wt. declined to 0·74 g. with 1000 w. It is ncluded that for this variety of cotton much the natural solar radiation is superfluous. In ts designed to study the effect (on this so-called ort-day crop) of prolonging the daily irradiation 500 w./m.^{2} to 12, 15, 18 and 21 hr. and to con- uous illumination, the data show that the ghest dry wt. per plant (5·91 g.) was obtained in interrupted light ; the lowest dry wt. of 2·76 g. s obtained in 12-hr. illumination. The number days from germination to initiation of flower ds was 21 under continuous light and 27 under -hr. illumination. As other varieties of *Gos- pium* are known to behave similarly, cotton does t strictly belong to the category of short-day nts [see Konstantinov, " Photoperiodism of the tton crop," 1934]. The question arises whether is possible to obtain augmented yields of cotton der short day, but with the same light intensity ich is optimal for high yields under continuous y. The following tests were made to elucidate is : cotton plants were grown (1) under 0 w./m.^{2} illumination in 11-hr. day ; (2) under 0 w./m.^{2} illumination in 11-hr. day ; (3) under 0 w./m.^{2} in 22-hr. day. Thus, plants in the (2) d (3) variants receive double the light energy plants in (1) ; in case (2) because of the increased ensity of illumination, and in case (3) because the longer day. After 15 days, the dry wt. of nts in (1) and (2) was 0·58 g. per plant ; while in the dry wt. per plant was 2·13 g. These results re confirmed in further tests of the same design, cept that the intensity of illumination used was 500 w./m.^{2} It is therefore obvious that a de- ficiency of light (short day) is not compensated per unit of time by an augmented intensity of light which is above 200 w./m.^{2}.—M.H.

FLAX

905 Mia, A. J. **The vegetative shoot apex of *Linum usitatissimum* L. and origin and development of leaf and bud primordia and foliar traces.** *Pakist. J. sci. Res.* 1955, **7**, No. 4, 159–64, bibl. 36. [Biol. Lab., Dacca Univ.]

JUTE

906 Indian Central Jute Committee, Calcutta. **Annual Report of the Jute Agricultural Research Institute (1954-55).** 1955, pp. 138. [Received April, 1956]

Investigations reported :

1. The effect of fertilizers on the formation and structure of jute fibres, pp. 19–20. Nitrogen, either from ammonium sulphate or from compost, increased the number of fibre bundles in the first layer near the cambium, but each fibre wedge contained fewer fibre bundles. Phosphate, on the other hand, increased the number of fibres in a fibre wedge by increasing the number of layers, although there was no effect on the total fibre content of the plant.

2. Effect of vernalization and photoperiods on the phasic development of jute plants, pp. 29–30. Pre-sowing cold treatment alone brought about an earliness of 15–18 days in flowering in *capsularis* varieties, while a lateness of about 8 days resulted in the case of *olitorius* varieties. Both species responded greatly to variation in daylength. Earlier flowering resulted when short photoperiods were given in the early seedling stage. First flowering was delayed about a week by long photoperiods.

3. Experiments on salt-resistance in jute, pp.30–1. The transpiration rate was more suppressed in the *olitorius* variety C.G. than in the *capsularis* variety D 154 under the same high saline concentrations of water culture.

4. Linear growth of internodes and their distribution along the stem, p. 33. Longer internodes were found in *olitorius* than in *capsularis* varieties.

5. Date of sowing experiments, p. 41. April sowings of either type gave the highest yields. Late varieties of both *capsularis* and *olitorius* proved significantly superior to early varieties.

6. Effect of DD on nematode (*Heterodera marioni*), p. 67. DD as a nematocide applied at the rate of 400 lb. per ac. 6 in. below the soil surface can bring about 100% mortality in about a fortnight.—P.M.G.

HIBISCUS

907 INDIAN CENTRAL JUTE COMMITTEE, CALCUTTA. **Annual Report of the Jute Agricultural Research Institute (1954-55).** 1955, pp. 138. [Received April, 1956]

INVESTIGATIONS REPORTED :

1. Seed-rate experiment with *Hibiscus cannabinus*, p. 76. With an increase of seed rate from 5 to 20 lb. there was a gradual increase in stand, green weight and fibre yield per ac. With further increases in seed rate beyond 20 lb., there was a general fall in the average base diameter, plant height, green weight and fibre yield, in spite of a gradual increase in stand per ac., up to a seed rate of 40 lb.

2. Seed-rate experiment with *H. sabdariffa*, p. 77. Seed rates from 5 to 40 lb. per ac. were used. The maximum yield of fibre resulted from a seed rate of 15 lb. per ac. ; with higher seed rates up to 40 lb. there was a progressive decrease in fibre yields, plant height and base diameter.

3. Spacing trial with *H. sabdariffa* var. *altissima*, pp. 78–9. Of 15 different spacings, 15 in. × 6 in. gave the greatest plant height and base diameter. The highest fibre yield resulted from a spacing of 9 in. × 6 in. and was significantly superior to the lowest yield which resulted from broadcast sowing. For a particular spacing between the rows, the spacing of 6 in. within the row resulted in greater fibre yield, plant height and base diameter than spacings of 2 and 4 in. within the row. With increase in spacing within the row, the average height, base diameter of plants and fibre yield generally increased while the mortality of plants decreased.

4. Combined yield trial of different fibre crops, p. 79. Mesta [*H. cannabinus*], roselle [*H. cannabinus*], sunnhemp [*Crotalaria juncea*], malachra, and jute [*Corchorus* spp.] were compared. Both roselle G.P. and roselle green gave significantly higher fibre yields than the other fibre crops at the 1% level. Sunnhemp and malachra gave significantly lower fibre yields than jute (D 154 and C.G.) and mesta (var. Laplantation).

5. Effect of different dates of sowing on the incidence of *Agrilus acutus*, p. 84. Sowings of *Hibiscus cannabinus* were made at intervals of about a fortnight beginning from 17 Feb. to 18 Aug. Plants from seed sown from mid-April to mid-May were attacked significantly more than plants from seed sown on other dates. Crops sown before mid-March showed no incidence of insect attack.—P.M.G.

OIL CROPS

SESAME

908 THOMAS, C. A. **Control of bacterial leaf spot of sesame by streptomycin seed treatme** [Abstract] *Phytopathology* 1956, **46,** No. 29.

Where naturally-infested seed of Palmetto *Se mum indicum* was soaked for 30 min. in so tions containing 250, 500, 700, or 1000 pp streptomycin, before being sown in isolated pl in Maryland and Virginia, no subsequent evide of *Pseudomonas sesami* was noted in the plan while untreated seed produced plants with considerable incidence of the disease. Concentr tions above 500 ppm. resulted in some retardati of seedling growth, but no reduction in stands. P.J.B.

LINSEED

909 CULBERTSON, J. O. and KOMMEDAHL, **The effect of seed coat color upon agronom and chemical characters and seed injury flax [linseed].** *Agron. J.* 1956, **48,** No. 1, 25– bibl. 10. [Agron. and Pl. Genet. Dep. ; Path. and Bot. Dep., Minnesota Univ St. Paul]

Isogenic lines were used for the first time to esta lish the association of seed-coat colour with oth characters in linseed. Yellow-seeded lines we higher in wt. per 1000 seeds, oil content, iodi number, and amount of damaged seed, but low in test wt. and yield of seed than brown-seed lines.—P.M.G.

910 ILJINA, A. I. **[The pigmentation of oil-fl seed.]** [Russian] *Doklady Akad. Na SSSR* (*Proc. Acad. Sci. USSR*) 1956, **10** No. 4, 729–30, bibl. 7, illus. [All-Union S Res. Inst. Oil Crops (VNIIMK)]

A study of the seed of different varieties of *Linu usitatissimum* has shown that there is a relatio ship between thickness of the seed coat, seed pi mentation and oil content. For example, t varieties VNIIMK 5237, VIR 1650, Safedak 52 and Udžan 5296 are characterized by the absen of pigmented cells and a high oil content, which higher in those varieties in which the seed-coat thinner, ranging (in % absolute dry wt.) fro 47·66 oil content and 38·02 testa in Safedak 52 to 42·08 oil content and 44·83 testa in Udž 5296.—M.H.

911 HANSEN, D. R. and MCGREGOR, W. **Comparative growth studies of flax [linsee varieties.** *Canad. J. agric. Sci.* 1954, **3** No. 6, 565–72, bibl. 10. [Cereal Crops Div Exp. Fm Serv., Ottawa]

The studies reported were made to determine t growth rates of linseed varieties and the extent which growth rates were associated with agronom characters and environmental differences, as i

icated by the cumulative height and dry weights f 5 linseed varieties sown at 3 different dates uring 1950–2. Varieties used were : Redwing, Raja, Redwood, Ottawa 770B and Ottawa 3693A. owing dates in 1950 were 16 and 31 May and 12 une ; in 1951, 10 and 25 May and 9 June ; and n 1952, 5 and 28 May and 12 June. There were wo major growth phases, one prior to flowering, hen plant height increased uniformly, and the econd at the time of flowering. The two phases ere separated by a break, which was thought to e associated with the production of fruiting ranches. Trends in dry-weight increase were imilar to those of growth rates. There were ignificant differences in relative rates of stem longation between two varietal groups, one containing Raja, Redwing and Ottawa 3693A (early nd medium-early), and the other Ottawa 770B nd Redwood (late-maturing). Growth rates were ssociated to a considerable extent with the lowering mechanism of the plants ; early-flowering varieties had the greatest relative rates of stem longation. There was a significant decrease in the elative rates of stem elongation between varieties own on the first and second dates of each year, hich was associated with a significant increase in he relative rates of dry-weight increase. These ifferences were not apparent between plants sown n the second and third dates of each year. Increased temperatures and numbers of hours of unshine were negatively correlated with rates of tem elongation and positively correlated with ates of dry-weight increase.—P.J.B.

AFFLOWER

12 PITTMAN, D. W. and DRAPER, C. I. **Safflower. Its possibilities and culture in Utah.** *Circ. 136. Utah agric. Exp. Sta.* 1955, pp. 16, illus.

Brief notes are given on the cultivation of safflower, *Carthamus tinctorius*). Experiences in Utah have hown that safflower can be grown successfully on oils capable of supporting spring barley. The crop ppears to be well adapted to desert areas with noderate irrigation supplies. It is resistant to pring frosts and hail. In varietal trials during 951–3, in which the crop was grown with one irrigation treatment, seed yields of N10, N6, N852, N5 and N8 averaged 1890, 1720, 1710, 1670 and 640 lb. per ac., respectively. Under dry-land conditions yields of N10 were significantly higher than hose of the other varieties and averaged 1350 lb. er ac.—P.J.B.

UNFLOWER

13† SCHUSTER, W. Saatzeitenversuche mit der Sonnenblume (*Helianthus annuus* L.). [**Time-of-sowing trials with sunflower** (*H. annuus*).] *Z. Acker- u. Pflbau* 1956, **100,** No. 3, 349–66, bibl. 29, illus. [Justus-Liebig Hochsch., Giessen, W. Germany]

In a 4-year experiment, observations were made on the effect of weather and of 7 sowing dates (between early-April and mid-June) on vegetative growth, seed yield, fat content of seed, diameter of the head, 1000-seed weight and hectolitre weight. The vegetative phase is shortened by later sowing; this is a temperature effect rather than one of photoperiod. The height attained by the plant depends largely on weather and is highest when the vegetative phase takes place during a warm period with high rainfall. The best cut for fodder is obtained when sunflower is sown in mid-June ; this is an important consideration when growing sunflower as a fodder catch crop. Highest seed yields are obtained when sowing takes place towards the end of April. Sowing later than early May is not advised because of ripening difficulties. Percentage of fat and of seed coat in the seed yield showed no clear relationship with time of sowing except that, in each year, the mid-June sowing gave the lowest percentage of fat and the highest percentage of seed coat. The 1000-seed weight and hectolitre weight remained fairly constant for sowings between early April and mid-May. With subsequent sowings there was a marked fall. The results have been statistically analysed and correlations worked out.—D.B.

914 ČUHNIN, Ju. A. [**Autumn sowing as a means of improving the quality of sunflower seed.**] [Russian] *Agrobiologija* (*Agrobiology*) 1955, No. 2, 114–15. [Timirjazev Agric. Acad., Moscow]

From a test (3 replications) on plots of 60 sq. m. at the above Academy there is evidence that autumn sowing of the *Helianthus annuus* varieties Saratovskiĭ 169 and Šortandinskiĭ 41 results in improved seed quality compared with spring sowing. This improvement is reflected in productivity of the subsequent generation. For example, the diameter of the capitulum is increased from 1·7 to 3·8 cm. ; weight of seed per plant from 3 to 7 g., and absolute grain weight from 2·9 to 3·1 g.—M.H.

915 SCHUSTER, W. Untersuchungen über die Wirkung der 2,4-Dichlorphenoxyessigsäure (2,4-D) und α-Naphthylessigsäure (NES) auf die Blüte und den Samen der Sonnenblume sowie die Nachwirkungen in den folgenden Generationen. [**An investigation of the effect of 2,4-dichlorophenoxyacetic acid (2,4-D) and α-naphthylacetic acid (NES) [NAA] on the flower and seed of the sunflower ; also the after-effects on the next generation.**] *Züchter*

1956, **26,** No. 3, 78–83, bibl. 16, illus. [Justus-Liebig Hochsch., Giessen, E. Germany]

IAA, NAA and 2,4-D were sprayed at 9 concentrations on sunflower at 4 stages of development: (a) 20–30 days after emergence, (b) beginning of flower-bud formation, (c) buds fully formed, (d) immediately before bud opening. IAA had no effect on the flowers, NAA had a weak effect and 2,4-D the strongest effect. Besides morphological aberrations, there were increases in the number of female flowers and decreases in male flowers, an abnormality which has a practical application for sunflower breeding. These 2 growth substances also exerted an effect on the seed and on the seedlings of the next generation. Germination was very variable, viz. 4–90%. The injury to seedlings was evident in the cotyledons. The growing point of many such seedlings died; others developed to maturity.—D.B.

RAPE

916 Oléagineux. Le colza en France. [**Colza (*Brassica napus* var. *oleifera*) in France.**] *Oléagineux* 1956, **11**, No. 2, 3 and 5, 75–82, 159–65 and 309–12, illus.

917 Dadd, C. V. **The cultivation of rape for oil extraction.** *Agric. Rev.* 1956, **1,** No. 11, 45–7.

The present situation in Britain with regard to the demand for the seed of this crop for oil is reviewed. Of the 7000 tons crushed in 1954, 1755 tons were home-grown. A broad outline of cultural methods is given for both winter and summer types of rape or Swede rape (*Brassica napus* var. *oleifera*) and turnip rape (*B. campestris* var. *oleifera*).—M.P.

918 Horita, R. and Fujizuka, S. **Studies on th methods of vegetative propagation of ra plant for ensuring the varietal character** [Japanese] *Proc. Crop Sci. Soc., Japan* 195 **24,** No. 1, 27–8, English summary. [Niiga Agric. Exp. Sta., Japan]

The variety Hamburg [of *Brassica napus*] was use Propagation methods were of two kinds, namely (a) permitting vegetative growth to continue fro the end of December to April in greenhouses temperatures of 20–25°C., or (b) inducing veget tive growth after the reproductive phase by th pinching-out of axillary buds in spring (1), repeate pinching-out of flowers (2), or by topping the ste (3). Of these techniques, (b) (2) was the most us ful and produced leaf buds suitable for propa ation by cutting in the following August.—Fro authors' summary.

919 Gisiger, L. Der Raps lohnt vor allem frü Stickstoffdüngung. [**Early nitrogen manu ing pays with rape.**] *Mitt. schweiz. Landw* 1956, **4,** No. 2, 29–32. [Eidg. Agrik.-Chem Versuchsanst., Liebefeld-Bern]

Rape develops early in the spring before the micr flora of the soil has resumed its activity. Ear applications (mid-March) of a N fertilizer at th rate of 50 kg.N/ha. gave marked increases i yield of grain and straw. In many instances, later application in mid-April, at the beginning flowering, at the rate of 25–50 kg.N/ha. also gav good returns. If applied both early and late, yiel increases were still higher. Autumn manuring, sowing time, was not beneficial. While the mi March application improved the oil content of th seed, the mid-April application resulted in a r duced oil content.—D.B.

LAND USE, SURVEYS AND MANAGEMENT

920† FAO. **Agriculture in the world economy.** 1955, pp. 76.

The purpose of this publication is to give an overall picture of the significance of agriculture in world economy. Particular emphasis is placed on trends in the relationship between agricultural production and population pressures.—P.J.B.

921† Pizer, N. H. **The coastal floods of January-February, 1953. An account of soil and crop problems which followed in the Eastern Province.** *Agric. Progr.* 1954, **29,** No. 1, 34–53, bibl. 4, illus. [Received Nov., 1955]

After brief notes on the coastline, coastal deposits, soils and the composition of flood-water and sea water, the following aspects of the subject are dealt with more fully: the assessment of injurious effects of salt water on crops and soils; the treatment and gypsum requirements of flooded soils the changes of salt levels in the flooded soil The sodium chloride content of soil can be ex pressed either as (a) g. NaCl per l. of soil moistur or (b) g. NaCl per 100 g. of air-dry soil. Th former, developed in the Netherlands, is th Dutch C-value; the latter, the NaCl percentage, less exact but is of greater use and value in th Eastern Provinces of England. The safe sal tolerance levels of spring-sown crops on averag mineral soils have been determined by the secon method (NaCl%), and are: 0·3 for rye, barley ryegrass, white mustard, swede-rapes and kale 0·2 for oats and lucerne; 0·15 for wheat, timothy white clover and broad red clover; 0·05 for fiel beans, peas and cocksfoot. Gypsum is essenti for the restoration of flooded arable soils bu affects only the top 3–4 in. of soil, at first, sinc

this is the most affected by salt injury. In forecasting the risk of injury to spring- and autumn-sown crops, the distribution of salt in the upper layers of soil and the drainage conditions are taken into account.—M.P.

922† HOWALD, O. Der Kleinbauernbetrieb von morgen. [**The small peasant-farm of tomorrow.**] *Schweiz. landw. Mh.* 1956, **33,** No. 12, 497–520.

The paper deals with the management and profitability of farms of 2–10 ha. on lowland or alp, both with or without non-agricultural side lines.—D.B.

923 JACKSON, W. A. D. **The virgin and idle lands of western Siberia and northern Kazakhstan : a geographical appraisal.** *Geogr. Rev.* 1956, No. 1, 1–19, bibl. 52, 2 maps. [Univ. Washington, Seattle]

Current Soviet projects for grain production on virgin and idle land in western Siberia and northern Kazakhstan are discussed. The geographical, climatic and edaphic circumstances of these regions are reviewed in relation to their potentialities for wheat production. It is regarded as very doubtful whether the projects will be able to solve the current Soviet grain problems, owing to the hazards of grain-growing in these regions.—P.J.B.

924† RATTRAY, J. M. and WILD, H. **Report on the vegetation of the alluvial basin of the Sabi Valley and adjacent areas [S. Rhodesia].** *Rhod. agric. J.* 1955, **52,** No. 6, 484–501, illus., 1 map.

Early in 1948, a reconnaissance ecological and botanical survey of a large part of this area, primarily the Valley-bottom Zone below 2000 ft., was carried out in connexion with the examination of the irrigation potentialities of the area. The vegetation was classified according to the soil type encountered. The method of survey was to record the distances occupied by the different types of vegetation as measured by the cyclometer of a car driven along the roads. Owing to the inaccuracy and inadequacy of the road map of the area, the distances on the cyclometer and the map differed, but the method proved useful for the purpose. All the species found in each area are listed, including those leguminous trees with pods of value as cattle food. The indigenous plants which may prove alternative hosts for insect pests of cotton, the weeds of irrigated land, and possible shade trees are also listed. A summary of the vegetation types is given with the conclusions to be drawn from the results of the survey.—M.P.

925† JONES, G. H. G. **The value and limitations of soil surveys.** [Abstract] *Proc. 2nd Inter-Afr. Soil Conf. Leopoldville 1954* 201–10. [Received Feb., 1956]

The subject is discussed with particular reference to the improvement of land utilization in Africa.—M.P.

FARMING SYSTEMS AND PRACTICES

926† AGRICULTURAL DEPARTMENT, NORTHERN NIGERIA. **Farming systems in Kano Province.** *Sols afr.* 1955, **3,** No. 4, 518–23. [Text in English and French]

927 CABRAL, A. L. À propos du cycle cultural arachide-mils en Guinée Portugaise. [**The crop cycle groundnuts/millet in Portuguese Guinea.**] *Bull. agron. 12. Fr. d'out. mer* 1955, 171–4, English summary.

The cycle groundnuts/millet is prevalent in the native agriculture of Portuguese Guinea. With the exception of tribes who prefer to grow swamp rice, groundnuts are the basis of the native economy, millets (*Pennisetum* and *Sorghum* spp.) being grown for food. According to soil fertility, the rotation is either millet/groundnuts/millet, or groundnuts/millet, followed by a fallow period of varying duration. These crops are grown on ridged or on flat ground, singly or in mixtures, e.g. groundnuts with *Pennisetum*, *Sorghum*, or *Vigna*. There is a tendency to grow erect groundnut varieties. Early millet varieties are mainly grown. Certified seed is distributed by the Government Agricultural Services. Tables show data of : areas under groundnuts, millet and sorghum and their production in various districts ; areas under these crops as percentages of the total cultivated areas ; and average areas under these crops per family in various tribes. Groundnut yields vary from 600 to 1200 kg., and millet and sorghum yields from 300 to 600 kg., per ha.—E.B.O.

928† KOSINSKIĬ, V. S. [**Field rotations in the southern Kuban.**] [Russian] *Zemledelie (Agriculture, USSR)* 1956, **4,** No. 1, 16–25.

The mild, warm climate of the Krasnodar territory is suitable for a wide variety of crops, and extensive areas are under winter wheat, maize, sunflower and other industrial plants. The precipitation averages 600 mm. p.a., the greatest amount falling in summer and the least in spring ; evaporation, however, is high because of the strong north-easterly winds. The soil is leached black-earth. Under these conditions, yields of the basic crop, winter wheat, are determined primarily by the

correct use of suitable rotations, which have been studied for many years by the V. R. Williams Soil Station in collaboration with the Krasnodar Selection Station. The merits of the various rotations for different zones in the region are recorded. For example, the yields of winter wheat (average for 5 years) in a rotation which included a lucerne/ryegrass sward during 2 years were 2740 kg./ha. compared with 1930 kg./ha. from spring wheat.—M.H.

929† KLINTWORTH, H. **Organic matter and soil structure.** [Abstract] *Proc. 2nd internat. Afr. Soils Conf. Leopoldville 1954* 356–64, illus. [Received Jan., 1956]

Work at the Grootfontein College of Agriculture has shown that on land under perennial fodder crops there was a positive correlation between water stability of the soil aggregates and the C-content of the soil. Under lucerne, the soil structure was poor and the organic matter low. Under annual crops, the stability of the soil structure varied with the activity of the microbiological population and not with the organic-matter content; increasing activity promoted good soil structure by reducing the C-content of the soil. —M.P.

930† TOURTE, R. L'engrais vert au Sénégal et en zone sahélo-soudanienne. [**Green manure in Senegal and the French Sahel-Sudan.**] *Bull. agron. 12. Fr. d'out. mer* 1955, 86–9, bibl. 6, English summary. [Cent. Rech. Agron., Bambey, Senegal]

Green manuring appears to be the only practical method for increasing the organic matter in the soils of these regions where, however, no legumes are available for this purpose. The millet (*Pennisetum* sp.) var. Souna early, is recommended for green manure. This crop develops rapidly, yields a great quantity of green matter which is easily ploughed under, and seeds well.—E.B.O.

931 GARTON, J. E. and CRIDDLE, W. E. **Estimates of consumptive-use and irrigation water requirements of crops in Oklahoma.** *Tech. Bull. T-57. Oklahoma agric. Exp. Sta.* 1955, pp. 26.

Data are given for estimating the irrigation requirements of crops in different areas of Oklahoma based on the methods developed by Blaney and Criddle.—P.J.B.

932† COOKE, G. W. **Recent developments in the use of fertilisers.** *Agric. Progr.* 1954, **29**, Pt. 2, 110–20, bibl. 13, illus. [Received April, 1956]

The following are reviewed: changes in fertilizer consumption in the United Kingdom from 1913–1954; fertilizer placement for potatoes, peas, beans and cereals; current fertilizer practice on grassland and arable crops; and the functions and efficiency of fertilizers.—M.P.

933† RÜSCH, J. D. Der CO_2–Gehalt bodennaher Luftschichten unter Einfluss des Windschutzes. [**The CO_2-content of layers of air near the ground under the influence of a windbreak.**] *Z. PflErnähr. Dung.* 1955, **71**, No. 2, 113–32, bibl. 27, illus. [Bremen, Kohlkökerstr. 53, W. Germany]

It is known that supplementing the quantity of CO_2 in the atmosphere surrounding a plant has a favourable effect on growth. The effect of windbreaks on the quantity of CO_2 in the air near the ground was investigated, using a new and simple procedure (described) for measuring CO_2. By day, the CO_2-content of the air within the protection of the windbreak was lower than outside. By night, any accumulation of CO_2 was slight. The CO_2-content of the air within the protection of the windbreak is the resultant of what is (a) used up in assimilation, (b) supplied by respiration of micro-organisms in the soil, (c) in circulation from the open atmosphere. In general, the effect of a windbreak on plant growth is favourable, in spite of the lower CO_2-content of the air within its protection: the improvement is attributed to reduced evaporation consequent upon less movement of the air. It is suggested that the attempts to "fertilize with CO_2" by supplementing artificially the quantity of CO_2 in the layers of air near the ground would meet with more success if a windbreak were present to reduce the movement of air and hence reduce the loss of additional CO_2 into the open atmosphere.—D.B.

SOIL AND WATER CONSERVATION

934† UNGER, K. Zur Abschatzung von Verdunstungsunterschieden verschiedener Pflanzenbestände am naturlichen Standort. [**Estimation of differences in evaporation from [soils under] different crops in their natural habitat.**] *Angew. Meteorol.* 1954, **2**, No. 1, 1–14, bibl. 18, illus. [Agrarmeteorol. Forschungsst. Quedlinburg, Neuerweg 23, E. Germany]

Characteristic differences were observed in the evaporation during July to September, 1952, from: soil left bare, and under a potato crop, single cabbage plants and grass. The subject matter is treated mathematically.—D.B.

935† SMITH, R. M. and others. **Summary of soil and water conservation research from the Blackland Experiment Station, Temple, Texas, 1942-53.** *Bull. 781. Texas agric. Exp. Sta.* 1954, pp. 54, bibl. 33, illus. [Received Jan., 1955]

936 BARTHOLOMEW, R. P. and others. **Effect of rainfall characteristics and soil management practices on soil and water losses in north-west Arkansas.** *Bull. 548. Arkansas agric. Exp. Sta.* 1954, pp. 54, bibl. 5.

The results are given of trials during 1935–53 on Newtonia silt loam with a 6% slope, to determine the effect of different cropping and cultural practices on soil- and water-losses. Average annual rainfall at the trial location was 44·63 in., with a range of 26·4 to 58·2 in. during the trial period. There were frequent periods of intense rainfall. Largest runoff losses were incurred on unploughed soil kept bare of vegetation ; such soils commonly suffered over 50% losses of rainfall as runoff. Ploughing effectively reduced runoff for periods of up to several months. *Cynodon dactylon* sward resulted in average runoff losses of 0·5 in. Cover crops of vetch and oats and hay crops also effectively reduced runoff. The effectiveness of the rotations used appeared to depend largely on the extent to which close-growing crops were included and on the amount of organic residues ploughed under. Rotations of maize, winter oats and red clover provided effective soil protection for 30 out of 36 months during the rotation. During the trial period, total soil losses from unploughed, bare soil were 684 tons per ac., an average of about 38 tons per ac. per annum. Total soil losses where the soil was ploughed in winter and spring were 425 and 617 tons per ac., respectively. *C. dactylon* sward suffered a total loss of 11 tons per ac., of which 5·1 tons were lost during the year of establishment. Vetch, sown in between maize rows in October, resulted in a total loss of 293 tons per ac. over 18 years. A 3-year rotation of maize/oats/red clover resulted in total losses of 227 tons per ac. This rotation maintained a level of productivity of 40 bu. maize per ac., compared with about 10 bu. per ac. after 18 years under continuous maize. Improvement of yields from badly eroded soil by means of appropriate crop rotations and manurial treatments appeared to be practicable.—P.J.B.

937† DULEY, F. L. **Stubble mulch farming.** *Sols afr.* 1955, **3,** No. 4, 524–33, illus. [Text in English and French] [U.S. Dep. Agric., Agric. Res. Serv., Soil and Water Conserv.]

938 EVELYN, S. H. **The Swaziland Irrigation Scheme. 2. Groundnut-shell-mulching of fallow land.** *World Crops* 1956, **8,** No. 2, 68–71, bibl. 2, illus.

Trials with maize, groundnuts and irrigated potatoes have confirmed the value of groundnut shells as a dry mulch. Yields were greater from dry-mulched fallows than from weedy or bare fallows, or where a cover crop of *Dolichos lablab* had been grown. Covering the land to a depth of 3–4 in. with groundnut shells proved sufficient. Weed growth was prevented, protection from termites was given, and all soil moisture was conserved. The shell-mulch maintained the soil in good condition, and did not affect ploughing efficiency or proper incorporation of the mulch. The beneficial effects of a groundnut-hay mulch were less marked and were of shorter duration.—M.P.

939† MORT, G. W. **Soil conservation on the North Coast [of New South Wales].** *J. Soil Conserv. N.S.W.* 1956, **12,** No. 1, 14–21, illus.

940† HUSTON, J. J. **Contour strip cropping on wheatlands at Wellington.** *J. Soil Conserv. N.S.W.* 1956, **12,** No. 1, 27–32, bibl. 1, illus.

The results of a 6-years' trial at Wellington Research Station with strip cropping are outlined. The advantages gained from this system of cultivation were : (a) control of erosion ; (b) almost complete absorption of rainfall ; (c) a build-up of fertility and nitrogen in the soil through stubble-ploughing and volunteer pastures of *Medicago minima.* These were offset by disadvantages, e.g. : (i) weeds in uncropped strips ; (ii) reduced stocking rates ; (iii) need for modifying rotational grazing. Overall results from strip cropping were unsatisfactory mainly because no suitable crop was available to grow in conjunction with wheat or oats.—M.P.

941† KALESKI, L. G. **Regeneration of marginal lands in the New South Wales wheat belt.** *J. Soil Conserv. N.S.W.* 1956, **12,** No. 1, 3–13, illus.

The soil conservation measures employed on gully-eroded lands by the Research Stations within the wheat belt, at Wagga, Cowra, Wellington, Gunnedah and Inverell, are described. The lands were classified according to their use and the conservation measures needed. Arable land in Class 3 received intensive mechanical soil conservation measures and was then sown to a wheat/subterranean clover ley/fallow rotation in the south and to a 5-year stubble mulch wheat/5-year lucerne ley rotation in the north. Wheat yields rose from 1·5 bu. per ac. in 1945 to 30 bu. per ac. in 1954. Land in Class 4, too steep for arable cultivation, was sown to permanent pastures of lucerne, *Phalaris* and *Trifolium subterraneum* in the south, and lucerne and *Chloris gayana* in the north. The steep natural pastures in Class 5 were not ploughed but, in the south, were intensively contour furrowed at 1–3 ft. vertical intervals, scarified, sown to *Lol-*

ium rigidum and *T. subterraneum* and top-dressed with superphosphate. In the north, *Ch. gayana* and *Urochloa panicoides* were sown. The steepest grazing lands of Class 6 required fertilizer applications, aerial or broadcast; lands in Class 7 were retained under forest or planted to forest with the exclusion of stock. Results were satisfactory; highly productive pastures were obtained and the stock-carrying capacity was increased. Soil loss and rainfall run-off were reduced to almost negligible proportions, compared with untreated land.—M.P.

WEEDS, WEED CONTROL AND WEEDKILLERS

942 WIESE, A. F. and DUNHAM, R. S. **Preplanting applications of IPC and CIPC for selective control of wild oats (*Avena fatua*).** *Weeds* 1954, **3,** No. 4, 321–30, bibl. 12. [Agron. Dep., Univ. Minnesota, Saint Paul]

Field and laboratory trials were carried out to determine the relative tolerance of wild oats and 10 crop species to IPC and CIPC; greenhouse trials were carried out to determine the effect of different factors on the herbicidal action of these materials. Crops used included: maize, linseed, barley, soyabeans, field peas, oats, buckwheat [*Fagopyrum esculentum*], millet [*Panicum miliaceum*], wheat, sugar-beet, and, in field trials only, sunflower. In the laboratory trials, buckwheat, wild oats, wheat, barley and linseed were most susceptible to the herbicides. Maize and millet showed an intermediate reaction to CIPC and were significantly less susceptible than linseed. Field peas, sugar-beet and soyabeans were significantly more tolerant to CIPC than were maize or millet. Field peas showed injury, while sugar-beet and soyabeans did not. In field trials in which pre-sowing applications of CIPC were made, wild oats could be selectively eliminated from sugar-beet, soyabeans, sunflower and field peas, but not from maize. CIPC at rates of 2·5 lb. per ac. almost eliminated wild oats. CIPC and 2 formulations of IPC at rates of 5–15 lb. per ac. severely damaged wheat, linseed and wild oats. There was some evidence of the specificity of CIPC for wild oats, as opposed to other grass weeds, including *Setaria viridis*, *S. lutescens* and *Echinochloa crus-galli*. Damage to wild oats occurred only where the seed was in contact with CIPC; where the seeds were below the level of the herbicide in the soil, damage was relatively slight. Wild-oat ecotypes from 2 locations appeared to respond similarly to CIPC. There were marked differences between soils in their effect on the toxicity of CIPC.—P.J.B.

943 ANDERSEN, R. N. and HELGESEN, E. A. **Some effects of post-emergence applications of Dalapon to wild oats.** *Weeds* 1954, **3,** No. 4, 351–8, illus. [N. Dakota Agric. Exp. Sta., Fargo]

Seed of wild oats (*Avena fatua*) was drilled about 3 in. deep in a Fargo clay soil. Dalapon (Na salt) was applied at rates of 4, 6, 8, 12 or 16 lb. acid equivalent in 40 gal. spray volume per ac. when the wild oats were in the seedling, early tillering, fully tillered and boot stages of growth. Best control followed treatment at the early tillering and fully tillered growth stages; at these stages, 4 lb. Dalapon per ac. resulted in almost complete control. Treatments made at the seedling stage were relatively less effective, while those made at the boot stage had little effect on vegetative growth. Tillering was significantly increased following treatment at all rates of Dalapon at all growth stages. Dalapon caused further tiller production when applied after normal tillering was completed. Control of heading was virtually complete where 4 lb. Dalapon per ac. were applied at the early tillering, or fully tillered stages; similar amounts of Dalapon applied at the seedling stage resulted in 78% control of heading and 22% control where applied at the boot stage.—P.J.B.

944† FAIL, H. **The effect of rotary cultivation on the rhizomatous weeds.** *J. agric. engng Res.* 1956, **1,** No. 1, 68–80, illus., bibl. 14. [King's Coll., Newcastle upon Tyne]

Couch grass (*Agropyron repens*) and twitch (*Agrostis* spp.) were completely eradicated in one season, in experiments over 4 years at 6 centres in Northumberland, by successive rotary cultivations at intervals. The treatment cut the rhizomes into short lengths, many of which died. Surviving pieces were killed by further rotovating. The number of rotovations required for complete eradication ranged from 2 in the driest soils to 6 in the wettest. Bracken (*Pteridium aquilinum*) was eradicated by rotovating in June, when the bracken fronds had expanded, and repeating the rotovations at intervals until a depth of 10 in. had been reached.—C.L.S.

945† PROPAGANDA RURAL. Destrucción del sorgo de Alepo. [**Control of *Sorghum halepense*.**] *Prop. rur., Montevideo* 1956, **54,** No. 1033, 18–20.

946 POHL, R. W. ***Thymelaea passerina*, a new weed in the United States.** *Proc. Iowa Acad. Sci.* 1955, **62,** 152–4, bibl. 1, illus. [Bot. and Pl. Path. Dep., Iowa State Coll., Ames]

A note is given on *T. passerina*, a weed common in south and central Europe and western Asia, which has been observed at 2 locations in Iowa and 1 in Nebraska.—P.J.B.

947 GRIGSBY, B. H. and others. **Control of cattails in drainage ditches.** *Down to Earth* 1955, **10,** No. 4, 14–15, illus. [Michigan State Coll., East Lansing]

Spray treatments for the control of *Typha* spp. were carried out in Michigan in 1953 and '54, using Dalapon, 2,4,5-T ester and Silvex, alone, or in combination. Rates of 13·6 or 20·4 lb. acid equivalent of Dalapon in 100 gal. water per 50-100 lineal feet of ditch, applied in June just before the plants flowered, resulted in excellent control by September. Amounts of 13·6 lb. Dalapon + 1–3 lb. 2,4,5-T ester, or 20·4 lb. Dalapon, alone or combined with 1–3 lb. 2,4,5-T ester, applied in June, 1953, resulted in no regrowth 15 months after treatment. Rates of 1–3 lb. 2,4,5-T ester did not appreciably reduce stands of *Typha* spp., but 2,4,5-T in combination with Dalapon was superior to Dalapon used alone. The treatments were made with high-pressure spray guns.—P.J.B.

948 WILLIAMS, R. H. ***Salvinia auriculata* Aubl. : the chemical eradication of a serious aquatic weed in Ceylon.** *Trop. Agric., Trin.* 1956, **33,** No. 2, 145—57, illus. [Shell Co. of Ceylon Ltd., Colombo]

A new spray designated "Shell *Salvinia* Weedkiller" (12% pentachlorophenol plus wetting agents in an oil emulsion) was applied twice, with an interval of 15–21 days between, at the rate of 10 gal. of weedkiller in 190 gal. water per ac. Within 3 weeks of the second spraying, both young and mature *Salvinia* plants had been completely destroyed. The plants generally sank below the water surface and disintegrated, causing no further hindrance to paddy cultivation. The morphology and habitat of *Salvinia auriculata* are described.—P.M.G.

949 GLUE, D. I. **Water hyacinth in New Zealand.** *Proc. 8th N.Z. Weed Contr. Conf.* 1955, 81–6.

An eradication measure which gives good results in small areas is to spray the *Eichhornia crassipes* plants with 3·6 lb. acid equivalent of ethyl ester or butoxy ethanol ester of 2,4-D plus 10 gallons of dieselene plus 200 gallons of water, giving all plants a thorough wetting ; then in 2 or 3 weeks giving spot applications to any plants which have survived or missed the previous spraying, with a more concentrated solution, such as 3·6 lb. acid equivalent of the same hormone in 80 gallons of dieselene. However, in general, very good kills have been experienced both with amine and ester 2,4-D, with and without dieselene. To make sure of getting a complete cover of water hyacinth plants growing among tall swamp vegetation it was found necessary to work carefully and systematically through swamps yard by yard. This is an extremely laborious and time-consuming job and it can readily be imagined that the expense of spraying water hyacinth out of a very large overgrown swamp would be gigantic.—Extract.

950† MITCHELL, J. W. **Development of brigalow country.** *Quart. Rev. agric. Econ.* 1955, **8,** No. 4, 179–84, bibl. 1, illus.

Brigalow lands, in Queensland and northern New South Wales, have a high potential for increased livestock production and for high-yielding crops of wheat and grain sorghum. Much of the area has highly fertile soils suitable for dry-farming techniques based upon the conservation of sub-soil moisture. The following methods of clearing brigalow (*Acacia harpophylla*) scrub are compared: ring barking and burning 4–5 years later ; mechanical pulling with burning a few months later: aerial spraying with 2,4,5-T at 1 lb. per ac. This last is still in its early experimental stages but shows promise, particularly for the treatment of regrowth.—M P

951 HUNT, J. L. **Weed control in arable crops.** *J. Inst. Corn agric. Merch.* 1956, **5,** No. 3, 157–63.

The range of weed-killers for use in crops of cereals, dredge corn, linseed, flax, sugar-beet and kale is discussed. A summary of the arable crops and the weed-killers which can be used for weeds in them, together with the appropriate application rates is presented in tabular form. Compatible and incompatible spray-combinations are mentioned.—M.P.

952 DERSCHEID, L. A. and WILSON, L. R. **Perennial and annual weed control in South Dakota.** *Circ. 102. S. Dakota agric. Exp. Sta.* 1954, pp. 35, illus.

Practical recommendations for weed control are given, based on the results of trials in S. Dakota and on recommendations made by the North Central Weed Control Conference.—P.J.B.

953 EKSTRAND, H. Undersökningar över berberis och svartrost. *2.* Groningsförsök med *Berberis vulgaris* L., med speciell hänsyn till natriumkloratets verkningar på groningen. **Germination trials with seeds of *Berberis vulgaris* L., with special regard to the effect of sodium chlorate on the germination.** *Medd. 69. Statens Växtskyddsanst.* 1955, pp. 29, bibl. 62, English summary.

The results are reported of trials to determine the effect of different rates of sodium chlorate on the germination of whole and de-pulped seeds of

Berberis vulgaris. Rates of 500 kg. sodium chlorate per ha. markedly reduced the germination of the seed and seedling growth of *B. vulgaris*. Rates of 1500 kg. per ha. resulted in the death of all seedlings. Low rates of sodium chlorate stimulated seed germination. At recommended rates of 300 ml. per m.^{2} (about 4500 kg. per ha.), no germination or seedling growth was possible.—P.J.B.

954† Holz, W. and Blaszyk, P. Versuche zur Inaktivierung wuchsstoffhaltiger Herbizide durch Adsorption an Kohle. [**Attempts to inactivate hormone-containing herbicides by adsorption on carbon.**] *Angew. Bot.* 1956, **30,** No. 1/2, 45–52, bibl. 4. [Pflanzenschutzamt, Oldenburg, W. Germany]

Following the interest aroused by the experiments reported in *Herb. Abstr.* 25 : 148 and *Fld Crop Abstr.* 8 : 134 a similar, but modified, method was tried on seed of *Trifolium repens, T. pratense, Pisum sativum* and *Linum usitatissimum* as well as on seed of garden vegetables. The modification introduced was the precoating of the seeds with a syrup solution, instead of a solution of starch paste, to provide the surface for covering the seed with activated carbon. Only *P. sativum* and *L. usitatissimum* remained undamaged. The other seeds died out. Since the method is convenient and economical, further modifications will be introduced to perfect it, possibly by allowing a certain time to elapse between spraying the soil and sowing.—D.B.

955 Yeates, J. S. **Crop tolerance trials with TCA.** *Proc. 8th N.Z. Weed Contr. Conf.* 1955, 111–13. [Massey Agric. Coll.]

The object was to test the tolerance of various crop seeds to TCA applied under field conditions in the particular conditions of soil and rainfall at the above College.—Extract.

956† Thompson, F. B. **Principles of pre-emergence weed control.** *Proc. 8th N.Z. Weed Contr. Conf.* 1955, 87–91, bibl. 8. [Rukuhia Soil Res. Sta.]

The materials used for pre-emergence treatments, the manner in which they act on the plants, and the conditions under which they may be used to best advantage are discussed.—Author's introduction.

957 Johnson, Mary P. and Bonner, J. **The uptake of auxins by plant tissue.** *Physiol. Plant.* 1956, **9,** No. 1, 102–18, bibl. 12. [Kerkhoff Biol. Labs., California, Inst. Technol., Pasadena]

Studies, using *Avena* coleoptiles, are reported on the uptake of 2,4-D by plant tissues and the effect of substances which promote or inhibit this.—P.J.B.

958 Birk, L. A. **Penetration of and persistence in soil of the herbicide 3-(p-chlorophenyl)-1, 1-dimethylurea (CMU).** *Canad. J. agric. Sci.* 1955, **35,** No. 4, 377–87, bibl. 11, [Chem. Dep., Ontario Agric. Coll.]

Applications of 80% commercial CMU were made to a fallow loam in June 1952 at rates ranging from 1·6 to 64 lb. of active ingredient per ac. Residual concentrations at 0–2 in., 2–4 in., and 4–8 in. depths were determined by chemical analysis, and winter wheat and oats were used as indicator crops. Based on the growth of cereal crops as indicators, CMU toxicity has persisted in the soil for relatively long periods. Three years after treatment, the 16 lb. per ac. plots showed only 65 to 70% survival of oats, and on the 32 lb. per ac. plots only the odd oat plant survived.—From author's summary.

959 Sund, K. A. **Plant regulator residues. Residual activity of 3-amino-1,2,4-triazole in soils.** *J. agric. fd Chem.* 1956, **4,** No. 1, 57–63, bibl. 8. [Stamford Res. Labs, American Cyanamid Co., Stamford, Connecticut]

960 Little, E. C. S. **The potentialities of helicopter spraying.** *Proc. 8th N.Z. Weed Contr. Conf.* 1955, 49–57. [I.C.I., (N.Z.) Ltd.]

CROP BOTANY

961† Simon, W. and Eich, D. Probleme und Methoden der Wurzeluntersuchungen (unter besonderer Berücksichtigung leichterer Böden). [**Problems and methods in the examination of roots with special reference to the lighter soils.**] *Z. Acker- u. Pflbau* 1955, **100,** No. 2, 179–98, bibl. 71, illus. [Inst. Acker- u. Pflbau Müncheberg/Mark, E. Germany]

Statistical analyses have demonstrated that the quantitative determination of roots is subject to greater error than is the determination of above-ground parts of a plant. A literature survey of the methods of root determination has shown that these differ chiefly as regards sampling. A new and simplified method of taking samples by means of the Albrecht soil borer is described. This borer is obtainable in different diameters, 8, 12, 20 or 30 cm., and samples can be taken from depths of 0–35 cm., 35–70 cm. or 70–105 cm. In the statis-

tical analysis of results there was no difference between the new method and the one of Köhnein and Vetter [*Herb. Abstr.* 24 : 943] at present in use. The superiority of the Albrecht method was in the more economical use of labour and in the relatively small area which is disturbed, an important consideration in serial sampling. Grasses produced greater quantities of roots than did legumes. Of 11 grasses, *Festuca ovina* produced the greatest mass of roots. Of 13 legumes, *Medicago sativa* yielded the most roots.—D.B.

962 Russell, R. S. and Adams, S. N. **The removal of plant roots from soil for the estimation of their phosphate content.** *Plant and Soil* 1954, **5,** No. 3, 223–5, bibl. 5. [Dep. Agric., Univ. Oxford]

In previous studies, the authors found that the separation of soil from barley roots by washing resulted in significant losses of phosphate and that this loss could be reduced by the use of solutions containing basic lead acetate. Following a report that the use of basic lead acetate was ineffective for this purpose, the present paper reports the results of the authors' experiences in the use of basic lead acetate.—P.J.B.

963† Macaulay Institute for Soil Research. **Annual Report, 1954-1955.** pp. 75.

Radioactive studies, pp. 39–40. "As part of an ecological investigation, a method of tracing the root systems of plants has been developed. Radiophosphorus was placed at various depths between 3 and 36 inches, placement for each depth being made to cover an area of approximately one square foot. After a suitable period of growth, the vegetation over each area was harvested and the plants separated according to species. Measurement of the radioactivity in the plant material indicated the size of the root system of the particular species at the depth of placement. From the satisfactory agreement between replicates and previous knowledge of root systems the method appears to be quite reliable. Excavation of sites with soil sampling has shown the method of placement to be effective."

964 Romberg, P. F. **A method for procuring large numbers of soil-free root tips.** *Bot. Gaz.* 1955, **116,** No. 3, 291, illus. [Wabash College, Crawfordsville, Indiana]

The process described furnishes a continuing supply of fresh material for cytological examination. In the apparatus described, the dimensions of which are 15 × 15 × 30 in., *Andropogon* could be kept in a vigorous condition, supplying fresh roots for 8 months.—D.B.

965† Blanc-Aicard, D. Études préliminaires sur l'adsorption radiculaire des cations. [**Preliminary studies on root adsorption of cations.**] *Ann. Inst. nat. Rech. agron. Ser. A. Ann. agron., Paris* 1955, **6,** No. 4, 615–33, bibl. 15, illus. [Cent. Rech. Agron. Provence, Antibes, France] [Received Dec., 1955]

[See *Soils and Ferts* 19 : 361.]

966 Norman, A. G. **Terramycin and plant growth.** *Agron. J.* 1955, **47,** No. 12, 585–7, bibl. 8. [Pl. Nutr. Lab., Univ. Michigan]

Terramycin (oxytetracycline) did not stimulate root growth or seedling development in maize, oats, barley or soyabeans. In the absence of soil, root growth was repressed by exposure to terramycin at low concentrations in nutrient solution. In vermiculite, sand, or soil, 10 ppm. terramycin caused no detectable change in seedling development. Field yields of maize and soyabeans were not increased by terramycin, but indications of a protective effect were obtained in one season, probably due to an antibiotic action against non-specific root pathogens.—P.M.G.

967† Schwabe, W. W. **Evidence for a flowering inhibitor produced in long days in *Kalanchoe blossfeldiana*.** *Ann. Bot., Lond.* 1956, **20,** No. 77, 1–14, bibl. 15, illus. [Res. Inst. Pl. Physiol., Imp. Coll. Sci. Technol., London]

Experiments are described in which periods of short-day treatment were interrupted by intercalated long days or light breaks during long dark periods. The effects of 24-hour dark periods preceding and following such intercalated long days were also investigated. Single long days intercalated between numbers of short days have a positive inhibitory effect on flower initiation. The inhibitory effect expressed as the number of inductive cycles annulled is approximately additive, provided that the long days are interspersed with short days, but not if several long days are given consecutively. On the average, 1 long day is capable of annulling the flower-promoting effect of about 1·5–2 short days. To a first approximation, flower numbers in *Kalanchoe* increase exponentially with the number of inductive cycles given—up to at least 12 short days ; the inhibitory effect of long days interspersed with short days also fits an exponential curve, i.e. the inhibition is roughly proportional to the amount of previous photoperiodic induction. A light break of as little as 30 seconds' duration given in the middle of a long dark period is as inhibitory as a long day. If followed by a long dark period the inhibition of an intercalated long day is almost completely neutralized ; a long dark period preceding it has no such effect. These results have been interpreted as due to the interaction of a flowering inhibitor with a reaction leading to flowering. A mechanism in-

volving competitive inhibition of an adaptively formed enzyme has been described as a possible example of the kind of reaction which could account for the results presented.—From author's abstract.

968† Prasanna Majumdar, G. **Stipules, stipels, ligules and leaf-sheath.** *Proc. Indian Acad. Sci.* 1956, **43,** No. 1, 9–22, bibl. 43.

The conflicting views of eminent plant morphologists of the last 75 years have been critically reviewed in the light of modern research. The following conclusions were drawn : (1) The leaf-base existed as " a primary element " of leaves of every kind. (2) The leaf-base existed in 2 forms : (a) totally incorporated into the axis as its outer mantle or axial component, and (b) partly as the axial component and partly as the leaf-sheath which was the vertical extension of the former free from the axis. (3) Stipules, stipels and ligules were outgrowths of the leaf-base formed only under the influence of branches of the laterals of the leaf trace. (4) Where the leaf-base existed only as the axial component, the leaf was apparently without a base, thereby suggesting the origin of the stipules to be cauline. (5) As stipules were outgrowths of the leaf-base, they could not by their fusion give rise to the leaf-sheath. (6) Ligules of grasses were composite structures. (7) The leaf-base, petiole and the lamina of a leaf could be distinguished, one from the other, on anatomical evidence. (8) The unilacunar condition of the node was the primitive form from which the trilacunar and then the multilacunar conditions must have evolved. (9) Leaf-sheath and sheathing stipules were morphologically distinct structures. (10) Stipules, ligules and leaf-sheaths were structures primarily meant for affording adequate protection to the axillary and terminal buds and their constituent parts. (11) Stipules, ligules and leaf-sheaths were homologous structures, for which a scheme of phylogeny was suggested.—P.M.G.

969 Arikado, H. **Studies on the development of the ventilating system in relation to tolerance against excess-moisture injury in various crop plants. 5. Various forms of the ventilating system in wheat, barley and some forage crop plants.** [Japanese] *Proc. Crop Sci. Soc., Japan* 1955, **23,** No. 4, 287–90, illus., English summary. [Univ. Mie]

Microscopic observations reveal that the crop plants resistant to injury from excessive soil moisture have a highly developed ventilating system and that the reverse is true of plants which are susceptible. The ventilating system may furnish the crop root with sufficient oxygen transported from the top.—From author's summary.

970 Fritz, G. and Beevers, H. **Cytochrom oxidase content and respiratory rates o etiolated wheat and barley seedlings.** *Pl Physiol.* 1955, **30,** No. 4, 309–17, bibl. 21 illus. [Purdue Univ., Lafayette, Indiana]

Extracts prepared from etiolated seedlings of pea wheat and barley were shown to contain cyto chrome oxidase at all stages of development (up t 12 days) by both the manometric and spectro photometric methods. When the amount of th enzyme in the tissue was evaluated in terms o activity at infinite concentration of cytochrome c it was found that the cytochrome oxidase conten of pea shoots and roots, and wheat and barle shoots, was more than adequate to account for th observed respiratory activity of the tissue fro which it was derived. However, for the roots o wheat and barley, although the enzyme is presen at all stages of development, the amounts ex tracted were not capable of catalyzing all of th respiratory oxygen absorption.—Authors' sum mary.

971† Lyttleton, J. W. **Relationship betwee photosynthesis and a homogeneous protei component of plant cytoplasm.** *Nature Lond.* 1956, **177,** No. 4502, 283–4, bibl. 4 [Grassl. Div., Palmerston North, N.Z.]

In the cytoplasmic protein of leaf cells, the presenc of two major fractions has been determined Fraction I is a homogeneous component of sedi mentation constant (S_{20}) 16–18 Svedberg units fraction II is a polydisperse component with mea S_{20} of 3–4 units. Fraction II displays a numbe of enzymic activities, whereas the biochemica function of fraction I has not been elucidated. Th author's tests with tissues from wheat and Italia ryegrass have given results which suggest tha fraction I is found only in photosynthesizing tissue —M.H.

972† Zalenskiĭ, O. V. [**Photosynthesis and fros resistance of crops in the high Pamir.** [Russian] *Trudy Bot. Inst. V.L. Komarov (Trudy Inst. bot. Acad. Sci. USSR) (Ser. 4 Exp. Bot.)* 1955, No. 10, 194–227, bibl. 56 illus.

Studies in progress on crops at the Pamir Biologica Station of the Botanical Institute, Academy o Sciences, Tadžik SSR, have shown that, in th high mountains of the Pamir, most species tolerat a lower temperature than when they are grow under more normal conditions. For example leaves of the potato plant normally are killed a −3°C., but in the Pamir they flourish at −6°C. and barley tolerates −12°C. To elucidate th causes of this, it is necessary to determine : (1 under what conditions of photosynthesis the plant begin an intensive accumulation of soluble sugars (2) whether it is possible so to control photo

synthesis that the accumulation of sugars can be regulated ; and (3) to what extent photosynthesis and the amount of accumulated sugars determine frost resistance in different plants. This work has been initiated in the Pamir with experiments on native and introduced plants, including spring barley, *Brassica rapa*, and some wild plants (*Agropyron tenerum, Artemisia pamirica, Elymus dasystachis*, spp. of *Eurotia* and *Gypsophila*). Richter's method of determining CO_2 absorption was used to measure photosynthesis, and Issekytc's method was used for carbohydrate analysis. The experiments were located in the eastern Pamir at 3860 m. a.s.l. The data show that an increase in accumulation by the plant of soluble sugars during autumn frosts is characteristic of all the introduced crops. Low temperatures retard starch formation, and consequently soluble sugars become the predominant product of photosynthesis. A retardation of plant growth is accompanied by the accumulation of sugars only when photosynthesis progresses at lowered temperatures. In the Pamir, however, at −8° or −12°C. plant growth is not restricted ; this is attributed to the fact that their high sugar content lowers the limit at which temperature restricts growth. Photosynthesis and the accumulation of sugars (primarily saccharoses) are inter-dependent and consequently sugar accumulation induces a lowering of the limit at which temperature restricts photosynthesis. A direct connexion between the average intensity of photosynthesis and the amount of accumulated sugars is not shown by all plants. For example, Golden Rain barley (of the high-mountain group) and rape, each with a general high level of photosynthesis, accumulate less sugars than do some plants with less intense photosynthesis. Such plants are highly frost-resistant and it is assumed that they accumulate " protective substances" of a different type, probably hemicelluloses. Plants which are at physiologically-young growth phases during freezing periods have an intense photosynthetic activity and accumulate a great amount of sugars. Agricultural measures (choice of sowing date, irrigation) which tend to retard ageing increase the frost resistance of such plants.—M.H.

973† Academy of Sciences, Poland. **Notes on Polish Science. 3. Water economy of plants.** *From Sect. 2. Discussion Session May, 1954* 1955, pp. 199.

The following papers by various authors are included in this publication : Water economy of plants ; State water resources in Poland ; Water as a factor in plant growth ; Water as a factor affecting groups of plants ; Critical periods in the water economy of plants ; Resistance of plants to drought, and methods of establishing and increasing this resistance ; Influence of agrotechnics on water economy in relation to plants.

—From information supplied by courtesy of the Polish Cultural Institute, 81, Portland Place, London, W.1.

974† Školjnik, M. Ja. and others. [**The effect of nitrogen on the length of the light phase in *Perilla ocymoides* L.**] [Russian] *Fiziol. Rast. (Pl. Physiol., USSR)* 1955, **2,** No. 6, 513–17, bibl. 6, illus. [V. L. Komarov Bot. Inst., Acad. Sci. USSR, Leningrad]

[See also *Herb. Abstr.* 15 : 327 and 1105.]—M.H.

975 Hewitt, E. J. and Bolle-Jones, E. W. **The production of copper, zinc and molybdenum deficiencies in crop plants grown in sand culture with special reference to some effects of water supply and seed reserves.** *Plant and Soil* 1954, **5,** No. 3, 205–22, bibl. 24, illus. [A.R.C. Unit Pl. Nutr., Long Ashton Res. Sta., Univ. Bristol]

For producing acute symptoms of Cu, Zn, or Mo deficiency in plants in large-scale sand-culture experiments, the use of rain water, purified by ion-exchange resins, gave results comparable with those where glass-distilled water was used. A single charge of ion-exchange resin would provide at least 15,000 l. of consistently satisfactory water over a 5-month period at a flow rate of up to 10 l. per hr. A summary is given of the more important general effects of Cu, Mo and Zn deficiency in a number of crops, including oats, wheat, maize, peas, sugar-beet and swedes. Studies on the effect of seed reserves in peas and beans showed that Mo reserves were sufficient to complete one generation, but reserves of Cu and Zn were insufficient.—P.J.B.

976 Stout, P. R. and Johnson, C. M. **Molybdenum deficiency in horticultural and field crops.** *Soil Sci.* 1956, **81,** No. 3, 183–90. [Univ. California, Berkeley]

977 Brown, J. C. and Holmes, R. S. **Iron, the limiting element in a chlorosis : 1. Availability and utilization of iron dependent upon nutrition and plant species.** *Pl. Physiol.* 1955, **30,** No. 5, 451–7, bibl. 17, illus. [Soil and Water Conserv. Res. Br., U.S. Dep. Agric., Beltsville, Md]

The effect of Cu on the absorption of Fe in maize, wheat and soyabean was examined.—D.B.

978 Brown, J. C. **Iron, the limiting element in a chlorosis : 2. Copper-phosphorus induced chlorosis dependent upon plant species and varieties.** *Pl. Physiol.* 1955, **30,** No. 5, 457–62, bibl. 16, illus. [Soil and Water Conserv. Res. Br., U.S. Dep. Agric., Beltsville, Md]

P and Cu were more effective in inducing Fe

chlorosis in wheat, rice and soyabean if applied to the growth medium together than if applied singly. In a chemical examination of leaves and sap, P and Cu were higher and Fe lower in the chlorotic than in the green plants.—D.B.

979 HEWITT, E. J. **Symptoms of molybdenum deficiency in plants.** *Soil Sci.* 1956, **81,** No. 3, 159–71, illus. [Long Ashton Res. Sta., Bristol, England]

A review is given of symptoms of Mo deficiency in a number of crop species, including *Beta* spp., Cruciferae, Gramineae, small- and large-seeded Leguminosae, *Linum usitatissimum*, *Fagopyrum esculentum* and *Solanum tuberosum*. Certain species are named as of use as indicators of Mo deficiency. —P.J.B.

980† PETERBURGSKIĬ, A. V. and SIDOROVA, N. K. [**The translocation of calcium and phosphorus in plants.**] [Russian] *Doklady Akad. Nauk SSSR* (*Proc. Acad. Sci. USSR*) 1955, **105,** No. 5, 1049–52, bibl. 3. [Timirjazev Agric. Acad., Moscow]

This work was carried out using labelled Ca and P in cultures of oats, peas, sunflower, clover and potatoes.—M.H.

981† WRIGHT, K. E. and BARTON, Nancy L. **Transpiration and the absorption and distribution of radioactive phosphorus in plants.** *Pl. Physiol.* 1955, **30,** No. 4, 386–8, bibl. 12, illus. [Smith Coll., Northampton, Mass.]

Using the autoradiogram technique on *Helianthus annuus*, it was shown that there is a positive relationship between the transpiration rate and the absorption of P^{32} and its translocation to the leaves, where it accumulated.—D.B.

982† VANECKO, S. and VARNER, J. E. **Studies on nitrite metabolism in higher plants.** *Pl. Physiol.* 1955, **30,** No. 4, 388–90, bibl. 7. [Ohio State Univ., Columbus 10]

Wheat leaves infiltrated with nitrite and exposed to light rapidly evolved 0_2, the amount evolved being proportional to the loss of nitrite. The light reduction of nitrite was dependent on the presence of chlorophyll.—D.B.

983† RAČINSKIĬ, V. V. [**Application of the isotope method in studying the effect of light intensity on the intake of mineral substances by plants. 1. Experiments with the isotope of phosphorus-32.**] [Russian] *Izv. Timirjazevsk. seljshoz. Akad.* (*Bull. Timirjazev agric. Acad.*) 1955, No. 2 (9), 193–210, bibl. 36.

984 GOUNY, P. Observations sur les particularités de l'alimentation ammoniacale en l'absence et en présence de calcaire. [**Obser vations on the special features of ammoniu nutrition in the absence and presence lime.**] *Ann. Inst. nat. Rech. agron. Ser Ann. agron., Paris* 1955, **6,** No. 4, 589–61 bibl. 25, illus. [Centre de recherches agr nomiques de Provence, Antibes, Franc [Received Dec., 1955]

[See *Soils and Ferts* 19 : 369.]

985† BERTRAND, G. and SILBERSTEIN, L. Tene en manganèse d'environ cinq cents échar tillons de phanerogames. [**Manganese con tent of approximately 500 phanerogams** *Ann. Inst. nat. Rech. agron. Ser. A. An agron., Paris* 1955, **6,** No. 4, 523–35, bibl.

The manganese content of the above-ground par of 462 species representing many families wa determined, expressed in mg. Mn/kg. dry matte and tabulated. The average Mn content fo species in the Gramineae was 78 and in th Leguminosae 72. Examples of Mn content i some individual crop plants of other families are *Sinapis arvensis* 44, *Brassica napus* 48, *Solanu tuberosum* 102, *Beta vulgaris* 28, and *Linu usitatissimum* 33. Examples of plants with ex ceptionally high Mn content are *Lupinus albus* 73 and *Melampyrum pratense* with 4530.—D.B.

986 EVANS, H. J. **Role of molybdenum in plan nutrition.** *Soil Sci.* 1956, **81,** No. 3, 199–20 [N. Carolina Agric. Exp. Sta., Raleigh]

987† BOWEN, H. J. M. and DYMOND, J. A **Strontium and barium in plants and soil** *Proc. roy. Soc. Ser. B.* 1955, **144,** No. 91 355-68, bibl. 37. [Radiobiol. Res. Uni A.E.R.E., Harwell]

A method for the determination of strontium an barium in plants and soil extracts is describe using the technique of activation analysis. It wa found that strontium was preferentially absorbe with respect to calcium from most of the soils b plants, while barium was taken up much les readily. Native plants may contain concentration of strontium of up to 2·6% dry weight whe growing on strontium-rich soils ; possible stron tium- indicator and -accumulator plants are dis cussed.—From authors' summary.

988† MOSOLOV, I. V. and VOLLEĬDT, L. P. [**Th physiological role of sulphur in plants** [Russian] *Doklady Akad. Nauk SSSR* (*Pro Acad. Sci. USSR*) 1955, **105,** No. 5, 1045–8 bibl. 9. [All-Union Sci. Res. Inst. Ferts Agrotech.]

989† HANNA, W. J. and PURVIS, E. R. **Technique for determining the nutrient status of soil**

and crops. *Bull. 780. New Jersey agric. Exp. Sta.* 1955, pp. 15, bibl. 12.
Procedures are described for determining the P, K, Na, Mg, NO_3-N, NH_4-N and B content of plants.—P.J.B.

990 PURVIS, E. R. and PETERSON, N. K. **Methods of soil and plant analysis for molybdenum.** *Soil Sci.* 1956, **81,** No. 3, 223–8. [New Jersey Agric. Exp. Sta., Rutgers]

991† SMITH, A. M. and MCCALLUM, E. S. R. **The determination of calcium and magnesium in plant material with disodium ethylene-diamin-tetra-acetate.** *Analyst* 1956, **81,** No. 960, 160–3, bibl. 13. [Edinb. and E. Scot. Coll. Agric., Edinburgh 8]

992† HEMINGWAY, R. G. **The determination of calcium in plant material by flame photometry.** *Analyst* 1956, **81,** No. 960, 164–8, bibl. 11. [Agric. Chem. Dep., Univ. Glasgow, Scotland]

993† VINCE, Daphne and others. **Studies on the effects of light quality on the growth and development of plants. 1. Apparatus for the growing of plants under controlled light and temperature conditions. 2. Formation effects in *Lycopersicon esculentum* and *Pisum sativum*.** *J. hort. Sci.* 1956, **31,** No. 1, 8–24, bibl. 39, illus.

994† STRZEMIEŃSKI, K. and WILLIAMS, R. M. **Total and radioactive phosphorus determination in small plant samples using the gravimetric method of Lorenz.** *N.Z. J. Sci. Technol. Sec. B.* 1955, **37,** No. 3, 243–57, bibl. 13. [Dep. Sci. Industr. Res., Wellington]

995† PIRIE, N. W. **A disintegrator for use with small quantities of fresh leaves.** *J. agric. engng Res.* 1956, **1,** No. 1, 81–2, illus., bibl. 5. [Rothamsted Exp. Sta.]

A unit for pressing batches of leaves up to 40 g. in weight through a slot of adjustable width is described. By this means the leaves are ground to a controlled fineness. For work on a small scale this method of grinding is preferable to others because it is repeatable, there is no need to add any fluid to the leaves and the ground material can be recovered quantitatively.—From author's summary.

996† TRICKETT, E. S. and MOULSLEY, L. J. **An integrating photometer.** *J. agric. engng Res.* 1956, **1,** No. 1, 1–11, illus., bibl. 8. [N.I.A.E., Silsoe, England]

997 GFELLER, F. **Plant growth chambers and their use in plant breeding.** *Commonw. Phytopath. News* 1955, **1,** Pt. 4, 57–9. [Cent. Exp. Fm, Ottawa]
Details are given of 4 plant-growth chambers in use at the Central Experiment Farm, Ottawa. These controlled-growth chambers enable 5 generations of cereal crops to be grown in one year and environmental conditions can be adjusted to suit problems under investigation.—M.P.

998 ZIMMERMAN, P. W. and HITCHCOCK, A. E. **Susceptibility of plants to hydrofluoric acid and sulfur dioxide gases.** *Contr. Boyce Thompson Inst.* 1956, **18,** No. 6, 263–79, bibl. 12, illus.
Studies are reported on the effect of HF and SO_2 gases on 49 species of plants, including crop species. The results are thought to be of value for diagnosing the symptoms of air pollution in industrial areas.—From authors' summary.

999 NIJDAM, F. E. L'analyse morphologique des caractéristiques agricoles des variétés. [**The morphological analysis of agronomic characteristics of varieties.**] *Acta bot. néerl.* 1955, **4,** No. 3, 452–9, illus. [Inst. voor Rassenonderz. van Landbouwgewassen, Wageningen, Netherlands]

MISCELLANEOUS

1000 HANLEY, F. **Crop husbandry experiments in Cambridge.** [Contained in] *Mem. 27. Univ. Camb. Sch. Agric. Rev. Ser. 10.* 1956, 5–10, bibl. 53.

1001 PANOS, D. A. **Three years of progress on experimental work in Greece, 1952-1954.** *Hellenic agric. Res. Sta., Larissa* 1955, pp. 25, illus.

1002 HERMANSEN, J. E. ***Brassica* crosses. 1. Crosses between swede and rape.** *K. Vet-Højsk. Aarsskr.* 1955, 33–52, bibl. 9, illus.

1003 ELLIOTT, C. S. **Biological problems encountered in crop improvement schemes. 1. General aspects of crop testing technique and recent results.** *Agric. Progr.* 1954, **29,** Pt. 2, 121–4. [Received April, 1956]

1004 BATTS, C. C. V. **Biological problems encountered in crop improvement schemes. 2.**

Developments in testing for resistance to disease. *Agric. Progr.* 1954, **29,** Pt. 2, 125–8, bibl. 7. [Received April, 1956]

1005† OYENUGA, V. A. **The composition and nutritive value of certain feeding-stuffs in Nigeria. 2. Concentrates.** *Emp. J. exp. Agric.* 1955, **23,** No. 91/2, 171–87, bibl. 21. [Div. Anim. Nutr., Fac. Agric., Univ. Coll., Ibadan]

The chemical composition and the calculated nutritive value of the cereal and protein concentrate feeding-stuffs grown in Nigeria have been examined. Maize, guinea corn and paddy rice were better sources of nutrients than bulrush millet (*Pennisetum typhoideum*). Acha grain (*Digitaria exilis*) was inferior to all the other cereal grains examined. The high nutritive value of the protein concentrates, African locust bean (*Parkia filicoidea*) and Bambara groundnut (*Voandzeia subterranea*), was demonstrated. The locally grown oil-seed crops tended to be somewhat low in protein, high in oil and fibre and average in mineral matter.—From author's summary.

1006† SCHAMBYE, P. and JACOBSEN, Ingeborg. **Cobalt content in some Danish soils, crops, fertilizers and concentrates.** *K. VetHøjsk. Aarsskr.* 1955, 53–77, bibl. 28.

Material has been accumulated in order to throw light upon cobalt-deficiency disease in ruminants, especially cattle, in Denmark. In studies of soil profiles, soil and crop samples were taken at 20 different localities in Jutland during the summer of 1951, selected and divided according to the soil types, namely, heath sand, diluvial sand and clay loam. The tabulated results of analysis show no consistent relation between the cobalt content of the soil and that of the corresponding crop sample. The Co content of the grass crops ranged from ·01 to ·21 ppm. in the dry matter; most samples contained between ·08 and ·11 ppm. Co. The Co content of cereal crops was very small, namely, from ·00 to ·07 ppm. In samples of beet pulp and beet tops, Co content ranged from ·00 to ·33 ppm.; in 14 cases it was higher in the tops than in the corresponding pulp. A brief comparison is drawn between cobalt investigations made in Denmark and abroad.—G.M.R.

1007† LARIN, I. V. [**The importance of perennial and annual grasses in regions where virgin and waste areas are utilized for agriculture.**] [Russian] *Zemledelie* (*Agriculture*) 1956, **4,** No. 1, 37-43, bibl. quoted but no references given.

Studies made by various authors in different localities (in the regions of Moscow, Kuĭbyšev, Kuban, Omsk, etc.) on the relative proportions of aerial and underground organs of crops have shown that in annual crops (winter rye, oats, barley, *Panicum* sp., wheat, chickpea and the mixtures vetch + oats, barley + oats), root weights constitute only 66% of the weight of the aerial organs. A harvest of 2000 kg. hay from perennial herbage corresponds to 3400 kg. root weight, but in the annuals a harvest of 2000 kg. corresponds to only 1320 kg. root weight. For annual plants to accumulate in the soil the same amount of organic residues as perennial herbage, the hay harvest of the annuals should be 2·5 times that of perennial herbage. A comparison of yields obtained from perennial herbage grown at 34 experimental stations on different soil types in the Steppe region with yields from annual grasses produced at 8 stations (in Slavgorod, Čkalov, Krasnokut and Saratov Provinces, among others) has shown that there is not a great discrepancy between yields from the two types of crops. This is attributed to the fact that in some areas the best annuals (sorgo, Sudan grass and maize) have not been tested. In the author's opinion, hay yields from perennial herbage on virgin lands should amount to approximately 800–2500 kg./ha. and from annual crops on such areas, 1600–5000 kg./ha. Annual and perennial crops suitable for sowing on virgin areas in the forest/steppe and steppe regions are mentioned.—M.H.

1008† MINISTRY OF AGRICULTURE, SOUTHERN RHODESIA. **Fertilizing food and general crops in S. Rhodesia. Notes on average amounts of nutrients required and methods of application.** *Rhod. agric. J.* 1955, **52,** No. 4, 315–29.

These notes, issued by the Chemistry Branch of the Federal Ministry of Agriculture, outline the average nutrient status of certain Rhodesian soils and suitable rates and methods of fertilizer application for different crops. Information is also given on the nutrient content of fertilizers and the calculation of the dressings required. The crops considered include cereals, potatoes, cotton, dwarf sorghums and sunflowers.—M.P.

1009† FOX, R. L. **Soil fertility and the quality of seeds.** *Diss. Abstr.* 1955, **15,** No. 11, 1962–3. [Univ. Missouri]

In trials with wheat and bromegrass [*Bromus inermis*] seed, favourable growing conditions for the parent plant resulted in improved seedling emergence from the seed. This effect was absent, or reversed, following unfavourable growth conditions. Moderate P treatments made to the parent plants increased the seedling emergence, while large amounts of P depressed seedling emergence. Seed from plants supplied with large amounts of major nutrients and trace elements often had low seedling emergence.—P.J.B.

1010† MUSKETT, A. E. and MALONE, J. P. **De-**

tection of seed-borne parasites in seeds. *Nature, Lond.* 1956, **177,** No. 4506, 465–6, bibl. 9. [Minist. Agric., N. Ireland]

Works on this subject are reviewed with special reference to use of the Ulster method (recorded in *Ann. appl. Biol.* 1941, Vol. 8, p. 8) and the modified Ulster method, by which term some pre-treatment of the seed before testing is implied.—M.H.

1011 Bolli, M. L'azione del talco sulla germinazione dei semi. [**The effect of talc on seed germination.**] *Ann. Fac. Agr., Perugia* 1953, **9,** 271–81, bibl. 10, illus., English summary. [Received Feb., 1956]

Trials were carried out to study the effect of talc on the germination of seeds of several species, including beans [*Phaseolus vulgaris*], maize and groundnuts. Seeds dusted with talc and untreated seeds were germinated at different temperatures. Results showed that talc treatment had no effect at the optimal temperatures for germination but that it accelerated germination at temperatures below or above the optimum. This effect of talc is attributed to its insulating property. The percentage of germinated seed was the same in the treated and untreated lots at the end of the trials. —E.B.O.

1012† Pfeifer, R. P. and others. **Photoelectric seed counter.** *Agron. J.* 1956, **48,** No. 2, 91–2, illus. [Wyoming Agric. Exp. Sta., Laramie]

A seed counter is described which depends on a feeder to separate the seeds by vibration and drop them, one at a time, through a light beam. It will count seeds the size of flax seed or larger. An accuracy of 99·6% can be obtained with fairly rapid counts of 100 seeds in 40 sec. At slower rates, 100% accuracy is attained, owing to better separation.—P.M.G.

1013 Kerr, W. E. **Handling and testing crop and vegetable seed in S. Rhodesia.** *Rhod. agric. J.* 1955, **52,** No. 4, 293–301.

Progress is discussed with regard to the control of seed prescribed under the Seed Regulations, 1953. Deterioration in seed imported through the tropics is mentioned. The problem of hard seed in green-crop legumes is discussed and a correction suggested for assessing the germination percentage in sunn-hemp and velvet beans where hard seed is present. —From author's summary.

1014† Farm Implement and Machinery Review. **"Scotmec-Oxley" moisture meter.** *Fm Impl. Rev.* 1956, **81,** No. 971, 1960–3, illus.

An account is given of a new moisture meter that gives an immediate and direct reading of the moisture content of grain in bulk or sack. It has also been used for testing baled straw and hay for internal dampness. The standard instrument has a probing depth of 8 in. and is calibrated for oats, barley, wheat, rye and maize. Other calibrations are being prepared. The instrument is also available with a ' tropical scale,' but the standard instrument with a ' temperate scale ' can be used under any climatic conditions in association with a temperature-correction dial. It has a range of 12%–25% moisture content and is accurate to within 0·5%–1%.—M.P.

1015† Stolze, K. V. Vom Meldedienst zum Warndienst. [**From recording service to warning service.**] *NachrBl. dtsch. Pflsch-Dienst., Braunschweig* 1955, **7,** No. 5, 87–92, bibl. 33, illus. [PflSchutzamt, Oldenburg, W. Germany]

Diagrams demonstrate how the distribution of the occurrence of plant diseases is recorded at a central office and how the warnings are passed on to the farmer.—D.B.

1016 Manning, H. L. **The statistical assessment of rainfall probability and its application in Uganda agriculture.** *Proc. roy. Soc. Ser. B.* 1956, **144,** No. 917, 460–80, bibl. 12. [Emp. Cott. Gr. Corp., Namulonge, Uganda]

1017† Walter, H. Die Klimagramme als Mittel zur Beurteilung der Klimaverhaltnisse für ökologische, vegetationskundliche und landwirtschaftliche Zwecke. [**The climagram as a means of evaluating climatic conditions for ecological, plant-growth and agricultural purposes.**] *Ber. dtsch. bot. Ges.* 1955, **68,** No. 8, 331–44, bibl. 2.

The climagram is constructed in the following manner : on the ordinate, mean monthly rainfall and temperature are so arranged on a scale that each interval of 10°C. corresponds with 20 mm. rainfall. A time scale in months of the year is constructed on the abscissa. Droughts are indicated by those periods when the curve for rainfall falls below the curve for mean temperature. Examples of climagrams for different parts of the world are given and it is claimed that the use of this method enables a rapid assessment of the climatic characteristics of given locations to be made.—P.J.B.

1018† Institut National pour l'Étude Agronomique du Congo Belge. Bulletin climatologique annuel du Congo belge et du Ruanda-Urundi, année 1954. [**Annual climatological bulletin of the Belgian Congo and Ruanda-Urundi, 1954.**] *Comm. 10. Bur. Climatol. INÉAC* 1955, pp. 161, illus. [Bruxelles]

1019 YOUDEN, W. J. and HUNTER, J. S. **Partially replicated Latin squares.** *Biometrics* 1955, **11,** No. 4, 399–405, bibl. 3.

1020 KRÜGER, F. H. and LOCHOW, J. v. Die derzeitige Anwendung der Methoden im deutschen Feldversuchswesen. [**Present d application of methods in German fi experimentation.**] *Z. Acker- u. Pflbau* 19 **100,** No. 3, 379–87, bibl. 4. [Inst. Pfla zenbau und Pflanzenzüchtung, Un Göttingen, W. Germany]

REPORTS

The notes below indicate the main investigations in the reports covered, in so far as they concern this journal. Where a separate abstract has been made from a particularly interesting section of a report, this is indicated.

1021 **Great Britain.** Edinburgh and East of Scotland College of Agriculture. Report for the year ending 30th September, 1955. Edinburgh, [n.d.] pp. 124.

Sugar-beet strangles, p. 38. It was confirmed that the growth stage of the plant at singling was an important factor and that higher seeding rates increased the susceptibility to this disease. At the 4-leaf stage, susceptibility became negligible, this being the stage when the primary cortex of the young hypocotyl was sloughed off.

The use of ammonia liquor as a fertilizer for potatoes, pp. 53–4. Injecting concentrated ammonia liquor (containing 12·7% N) into the soil at a depth of 4 in., at the rate of 56 lb. N per ac., had no effect on yield, whereas at the rate of 112 lb. N per ac. potato yields were significantly decreased.—M.P.

1022 **Republic of Ireland.** Ministry of Agriculture. Twenty-fourth Annual Report of the Minister for Agriculture 1954–55. [n.d.] pp. 174, append + index pp. 86. [Received April, 1956]

Crop variety trials pp. 61–2. Wheat. Atle, Progress, Karn II and Pondus were tested at 53 centres. Progress outyielded Pondus by 1·9 cwt. per ac. Oats. Sun II outyielded Blenda and S. 84 on average at 51 centres ; Triumph was the lowest yielder. Fodder-beet. Results confirmed those obtained in the previous year. [See Abs. 140.] Oats, p. 11 [append.]. Glasnevin Triumph proved superior to other varieties on average to rich soils.—M.P.

1023 **Switzerland.** Eidg. Landwirtschaftlichen Versuchsanstalt, Zürich-Oerlikon. [Report of activities of the Federal Agricultural Research Station, Zürich-Oerlikon, for 1954.] *Landw. Jahrb. Schweiz* 1955, **69,** No. 5, 383–446, bibl. 46, illus.

INVESTIGATIONS REPORTED :

1. Biological tests with plant-protection ager in field cultivation, pp. 411–15.

(a) A 2% solution of Bordeaux mixture was st the best agent for the control of *Phytophth infestans* on potato. Copper derivatives of orga compounds were not wholly satisfactory and t " purely " organic compounds were worthless.

(b) For controlling potato beetle, a remarkab good result was obtained with Piroxvariante powder which combines S, Cu, Malathion a Aldrin) applied at 200 g./are.

(c) The following agents were used in controlli leaf aphids on potato : 20% diazinonemulsion a 20% diazinonsuspension ; 1% diazinon dust ; 40% Malathion preparation ; and a 6% Isol preparation. These agents were able to keep t multiplication of aphids in check, but did n prevent the spread of the virus infection.

(d) In the control of dwarf bunt [*Tilletia bre fasciens*] on cereals, soil treatment with disi fectants was more effective than seed treatment.

2. Varietal trials with cereals, pp. 427–31. T writer expresses dissatisfaction with the prese arrangement by which varietal trials are conduct by the department which has bred the varieti For independent judgement, it is urged that the two functions should be performed by differe departments.

(a) Winter rye. Two foreign varieties showed marked superiority over Petkuser (the standar The German variety Carstens was noteworthy its rigidity and was easier to cut than the Dut variety Dominant. The Swiss hybrid, Fellerser Petkuser, developed for high altitudes, gave a po yield in the lowlands.

(b) Spring rye. Karlshulder was easy to cut, a is proposed for the official list. Bernaroggen w equal to its competitors.

(c) Winter wheat. Foreign varieties were test against Mont-Calme 245 and Probus. Cappe and Heine VII were very good for rigidity and hi yields, but in other respects they were inferior the Swiss varieties. In Tessin, 6 new Itali varieties were compared with Salto already cul vated there. All 6 ripened earlier and produc wheat of poorer quality than Salto. Time- sowing trials were carried out in, and with assistance of, several Cantons in the northern h

of Switzerland. Highest yields were obtained when seed was sown before 15 October ; if sown later there was a marked fall in yield.

(d) Spring wheat. Lichti I and the German variety Erli gave the best results. Huron and the Canadian Redman gave quite inadequate yields in the lowlands. In the alpine regions where black rust [*Puccinia graminis*] is prevalent, the Zürich-bred strains gave the best yields, followed by Regent and Redman ; Huron and Lichti (susceptible to the disease) gave very poor yields here and it is again stressed that there is no hope of a successful crop of spring wheat in the alpine valleys of central Switzerland unless varieties resistant to black rust are cultivated.

(e) Winter barley. Of the foreign varieties tested, using Riniker as standard, Dea was, as in previous years, a good yielder and resistant to lodging. It is provisionally included in the official seed list while undergoing further tests.

(f) Spring-barley. A number of German varieties, obtained by crossing with a mildew-resistant strain from Weihenstephan, was tested in Zürich-Oerlikon against the Danish variety Kenia. They were all less susceptible to mildew than were the well-known Dutch, Swedish and Danish varieties. This resistance was especially marked in Ackermann BJM 33 and 34, and the latter could be relied on to give high yields. Of brewing barleys, tested near Schaffhausen, the Swedish variety Herta excelled in grain yields and resistance to lodging, and in yield was closely followed by Proctor (of Cambridge).

(g) Oats. Good grain yields were obtained from the following varieties ; the percentages in parentheses indicate incidence of frit-fly : Marne (Dutch) (39·4%) ; Flämingstreue (not sufficiently resistant to lodging) ; Sisu (Finnish) (40%) ; Blenda (Swedish) (33%) ; and Firlbeck Gelbhafer I.

(h) Maize. Hybrids developed at Zürich-Oerlikon were markedly superior to hybrids from Wisconsin and the Netherlands. Orla 266 was admitted to the official seed list and released for distribution. It was superior to Wisconsin 255 in yield, resistance to lodging and seedling development, but was rather late in ripening. An investigation into population density indicated that the optimum spacing for maize was 6 plants per $m.^2$

3. Experiments with potatoes, pp. 432–4.

(a) Breaking of dormancy. The procedure adopted combined several methods which included treatment with Rindite, and sprouting for a short period at 27–28°C., followed by stimulation using the Arenz method. During the warm treatment the tubers were sprayed with a solution of a thiocarbamate. With this procedure for breaking dormancy, no rotting took place and the plants developed normally.

(b) Effect of late planting on quality of seed potatoes. Bintje, Voran and Ackersegen were planted in 2 locations in Tessin (Mezzana and Gudo) on 3 dates between 23 July and 25 August. In Gudo, plants suffered from frost but in Mezzana, even the latest planting gave yields of 200 kg./are.

(c) A controlled experiment on date of clearing diseased tops demonstrated a markedly lower incidence of leaf roll and mosaic disease in subsequent crops the earlier the diseased plants of the previous crop had been cleared from the field.

(d) Experiments are in progress to determine the influence of heavy N- and K-manuring on the speed of travel of viruses within the potato plant.

4. Experiments with fodder- and sugar-beet, pp. 434–5.

(a) Bolting during varietal trials. [See *Fld Crop Abstr.* 8 : 926.]

5. Topine, p. 436. The cultivation of topine is a new feature in the Station trials. Hitherto, *Helianthus tuberosus* was considered to be worthless in a crop rotation because of the difficulty of cleaning the ground of the crop. However, it is claimed that in topine [a species hybrid between *H. tuberosus* and *H. macrophylla*], the tubers grow in clusters and so can be cleared from the soil as easily as potatoes. In trials in Tessin, Witzwil and Zürich-Oerlikon, good yields of stems, leaves and tubers were obtained, but on a few plants only did the tubers grow in " nests," and these were irregular in shape.—D.B.

1024 **Switzerland.** Eidg. Agrikulturchemische Versuchsanstalt, Liebefeld Bern. [Report of activities of the Federal Agricultural-Chemical Research Station, Liebefeld-Bern, in 1954.] *Landw. Jahrb. Schweiz* 1955, **69,** No. 8, 917–39, bibl. 7.

Investigations reported :

1. Potassium manuring of potatoes, p. 932. Application of K salts, in addition to farmyard manure, on mineral soils not requiring K, resulted in a 5% increase in yield of tubers ; but a higher starch yield was obtained without the additional K.

2. Manuring of potatoes on peaty soils with K and with different forms of phosphate, pp. 932–3. The results are described as interesting and surprising. (a) KCl at 120 and 240 kg. K_2O/ha. gave an increase in yield of tubers of 3200 and 4300 kg./ha., respectively, but a decrease in starch content. (b) K_2SO_4 applied at the same rate gave a higher yield of starch and of dry matter, but a slightly lower yield of tubers [see Abs. 883]. (c) On peaty soils not lacking in phosphate, the addition of phosphate as superphosphate and as Röchling-phosphate gave increased yields of tubers, but if applied as Thomas phosphate the increase was not so great. (d) The Mn content of the leaves varied according to the phosphate used : with superphosphate 3·2 mg. Mn/100 g. dry matter ; with Thomas phosphate and Röchlingphosphate 2·5 mg. Mn/100 g. dry matter.

3. Oilseed rape trials, p. 934. Varietal trials are proving that other varieties, namely, Scherwitz St. 1236, Dippes platzwiderstandsfähiger, commercial Lembke, Hammenhögs Regal, Svalöfs Tenus and Weibull's Margo are superior in seed yield to Lembke Hochzucht and Lembke platzfester.
4. Soil cultivation, pp. 934–5. A table shows yields of winter wheat, rye, potatoes and clover/grass after shallow ploughing and normal " fork-deep " ploughing. With the exception of rye, all of these crops produced higher yields after shallow ploughing.—D.B.

1025 **USA.** Fort Hays Branch Station, Hays, Kansas. Fall Field Day report for 1953–54. *Circ. 315. Kansas agric. Exp. Sta.* 1954, pp. 29.

INVESTIGATIONS REPORTED :
1. Sorghums, p. 4. Highest grain-sorghum yields during 1951–3 were given by Midland, Plainsman and Westland, with 42, 41·3 and 40·3 bu. per ac., respectively. Row-space trials in the western Kansas wheat country indicated that row spacings of 40 in. gave the highest yields in a dry season, and 20 in. rows in a wet season.
2. Winter wheat, pp. 5–6. In varietal tests during 1948–52, highest yields were given by Wichita, Kiowa, Triumph and Comanche, with 28·1, 27·7, and 26·7 bu. per ac., respectively. Concho yielded an average of 30·5 bu. per ac. over a 4-year period.
3. Winter barley, p. 6. Yields of Dicktoo, Reno and Kearney, grown during 1951–3, averaged 25·5, 18·3 and 23·4 bu. per ac., respectively.
4. Spring barley, pp. 6–7. Yields of the medium-early varieties Otis, Custer and Velvon BC 4–68 during 1949–54 averaged 31·2, 31·7 and 29·2 bu. per ac., respectively. Otis had very weak straw.
5. Oats, pp. 7–8. Highest yields during 1951–4 were given by Kanota, Mo 0–205 and Andrew, with 49·8, 48·8 and 48·3 bu. per ac., respectively.
6. Bindweed [*Convolvulus arvensis*] control trials, pp. 15–16. Bindweed was eradicated following an average of 16·2 cultivations to a depth of 4 in. made within 12 days after each successive emergence of bindweed. One year of intensively cultivated fallow, followed by 3 years of wheat, sown early in October, with intensive cultivation between harvest and sowing, eradicated bindweed within 3–4 years and was a practical technique. Of soil sterilants, sodium chlorate was the most effective. An application of 3–4 lb. per ac. in early autumn, repeated during succeeding years, was satisfactory.
7. Weed control in sorghum, pp. 16–17. 2,4-D often damaged sorghum and could be recommended only as an emergency measure. The crop was damaged by treatments at virtually all growth stages.—P.J.B.

1026† **East Africa** Royal Commission. Report 1953–1955. Cmd 9475. London, pp. xiv – 482, 17s. 6d.

Part V of this report, Conditions of developmer of the land (pp. 251–378), is divided into th following chapters : Agricultural potential Present land use ; Alternatives to customary lan use ; Tenure and disposition of land ; Agraria administration. The following maps are include in a pocket at the end of the report, all on the scal of 1 : 3,000,000 : East Africa, general ; Eas Africa, population, tsetse fly and rainfall ; Kenya boundaries, land units, population, tsetse fly an rainfall.—A.G.G.H.

1027 **East Africa.** East African Agriculture an Forestry Research Organisation. Annua Report 1955. Record of research for th period 1st January 1954 to 30th June 195 Nairobi, [n.d.] pp. 114. [Received February 1956.]

INVESTIGATIONS REPORTED :
1. Soil-moisture storage and depletion in arabl rotations, Tanganyika, pp. 5–6. Maize, sorghu and groundnuts used less stored soil moisture tha did the indigenous volunteer herbage. Sowing tef (*Eragrostis abyssinica*), on a weed-free, wate storage fallow, at 90 lb. per ac. in the first rotatio restricted its root range to about 2 ft., and th water conservation equalled that of bare fallo at the end of 7 months of very hot, dry weathe Teff, sown in the second rotation at 45 lb. per ac exhausted the available moisture to a depth of 3 f and conserved only a little more than maize o sorghum.

2. Water use on simple rotations, p. 6. Leys o *Cynodon dactylon* grew well at Muguga, but in les than a year had reduced the top 10 ft. of soil t wilting point. Oats and beans drew their wate from the top 6 ft.

3. Rainfall as a controlling factor in the yield o maize, pp. 13–16. The west Rift area of th Kenya Highlands was selected for this study. I the drier regions, increasing rainfall increase yields, whereas in the wetter areas increasin rainfall decreased yields. A curve of the for $Y=Ax^b e^{-ax}$ where Y is yield, x is rainfall and A b and a are constants, was shown to fit the record from all parts of the area. The curve was used as basis for yield estimation, and it indicated tha yield was a product of the interaction betwee rainfall and soil fertility. The farms appeared t be equally distributed over the range of rainfal suited to the cultivation of maize in this region.

4. Cassava, pp. 36–9. Clones showing a hig degree of resistance to mosaic and brown streal were 4723A/26, 46106/27, and 4763/16 ; they yielded at the rate of 25, 27 and 35 tons of fres root per ac., respectively.

5. Maize trials, Eldoret, pp. 39–41. Four maize varieties were sown at rates of 7260, 10,890 and 14,520 plants per ac. Sulphate of ammonia was applied at 56 and 112 lb. per ac., and superphosphate at 80 and 160 lb. per ac. All the varieties responded similarly to treatments. Yields per ac. rose with an increase in plant population, the yield difference between the lowest and highest plant densities being 4·5 bags. [1 bag = 200 lb.]. There was a significant response to 80 lb. superphosphate per ac., the phosphate apparently ensuring a higher proportion of productive plants, irrespective of the population. Sulphate of ammonia decreased yields. At the high plant density there was a higher proportion of non-silking plants.

5. A new *Puccinia polysora* race is reported at Muguga, p. 45.

7. Insecticide research with cotton, pp. 56–7. [See Abs. 1030.]

8. Experimental farm, 6500–6900 ft. a.s.l., pp. 90–4. Bulrush millet flowered but failed to set seed Oats were of value for hay and silage, but when left for grain failed to attain a good bushel-weight. Fiwi beans were a promising crop, being hardy, drought-resistant, and, so far, unattacked by any pest.

9. Diseases of groundnuts, pp. 108–10. The variety Mwitunde showed most resistance to both rosette and leaf-spot attack; Kenyoma was somewhat resistant to leaf spot.

10. American rust disease of maize, p. 111. [See *Fld Crop Abstr.* 8 : 1236.]

11. Effect of low soil calcium on groundnuts pp. 112-14. Results confirmed that the occurrence of unfilled shells was associated with low soil Ca. Muriate of potash, in the absence of superphosphate, also considerably reduced the shelling percentage.—M.P.

1028 **Kenya** Department of Agriculture. Annual Report for 1954. Vol. 2. Record of Investigations. Nairobi, 1955, pp. 253. [Received March, 1956]

INVESTIGATIONS REPORTED :

1. Report of the Senior Entomologist, pp. 1–12. Several sprays were tested for the control of insects on the walls of a maize store. Urea formaldehyde resin containing 2% BHC + 20% DDT, at 2 gal. per 1000 sq. ft., was fully effective for 6 months against *Calandra*, *Tribolium* and *Oryzaephilus*. The treatment of maize in bags with an insecticide containing 0·1% pyrethrins + 1·6% piperonyl butoxide at 12 oz. to the bag continued to give effective protection against all pests, 15 months after application. Impregnating the fabric of bags with pyrethrum/piperonyl butoxide, in addition to fumigating the maize-filled bags with methyl bromide, afforded no protection against *Calandra* and *Tribolium*. On the Kano Plains, cotton yields were raised from 350 lb. to 800 lb. per ac. by high-volume spraying with 1 lb. DDT and 0·3 lb. BHC per ac., applied 5 times at 10-day intervals during August and September.

2. Seed testing, pp. 17–18. Treatment by oven drying for 3 days at 40°C. increased the germination of immature sunflower seed from 30% to 95%. Aldrin and Dieldrin at standard and double the standard rates did not depress the germination of wheat and barley.

3. Report of the Soil Chemist, pp. 19–40. The early results of exploratory and long-term fertilizer trials are given. The responses to the fertilizer treatments of the different crops used, were influenced mainly by the nutrient status of the soil, and the rainfall of the locality. It was noticed that wheat on plots receiving potash was less infected with leaf rust than that of the no-potash plots. Cu was beneficial to the production of wheat grain and dry matter on Njoro Pumice soils. Maximal yields were obtained, in the trials, from 40 lb. Cu and 140 lb. double superphosphate per ac., but visual deficiency symptoms were still evident, and many empty heads were formed.

4. Report of the Senior Plant Breeder, pp. 41–63. Wheat. Top-yielders at Njoro were 359 AA.8.B.1.A., Granadero Klein, Mida Cadet and four 358 selections. Contrary to the previous season's results, the 358 selections yielded better than the 356 series. At Eldoret the 360 F.8.X. selections again headed the list, followed by the 354's. The previous year's results were reversed at Ol Joro Orok where the 362B.1. selections were top-yielders. On the Kinangop the 362 B.1. selections have mostly done well. Capella, 362 A.1.D.1., 362 B.1.A.3., 363 B.1.A.4. and 362 B.1.E.4. are likely to be useful varieties for this area. During 1954 the variety 351 AS.1.B.2. was released [See *Fld Crop Abstr.* 8 : 768]. Barley. The trial at Njoro was damaged by bulb fly (*Hylemyia arambourgi*) and yields from each variety were not significantly different; No. 5, Kenia, Rigel and Research headed the list. At Eldoret, Velvon, Binder, No. 5, Tregal and Trebi were top-yielders. The trial at Ol Joro Orok was damaged by locusts at an early stage of growth but yields were good, Trebi, Heimdal and Velvon yielding 21·2, 15·5 and 15·4 bags per ac., respectively. [1 bag = 180 lb.] On the Kinangop, Trebi, Kenia and Velvon yielded best with 18·5, 16·9 and 16·6 bags per ac. Oats. At Eldoret the 1953 trends were reversed and yields were low. The best yield was given by 3003F with 13·6 bags per ac. [1 bag = 150 lb.]; Mulga and four RL selections followed with under 10 bags per ac. At Kitale, in the first year of the trials, yields were low, but Vichland, Lampton and Vikota were top-yielders. On the Kinangop the best yielders were Vicland, Boone and Vichland, with 21·3, 19·4 and 18·6 bags per ac., respectively.

5. Report of the Plant Pathologist (Plant Breeding), pp. 64–8. The reactions of 9 wheat varieties to strains K9–K14 of *Puccinia graminis* are tabulated.
6. The cultivation and cropping of vlei soils, pp. 137–40. Results with the camber-bed system of cultivation are given. [See Abs. 579.]
7. Report of the Agricultural Officer (Experiments), Coast Province, pp. 204–17. In a cassava variety trial, 46106/26 was the outstanding clone. The cotton variety, N17 was the lowest yielder in all the trials. S47 was outstanding for early maturity and, with UK48, was most resistant to jassid. In ridging, mulching and FYM trials at Matuga, grain yields of sorghum, as a long-rains crop, were depressed by ridging, increased by manuring and showed a negative interaction between ridging and mulching of 326 lb. per ac. Mulch increased the yields of green gram, as a short-rains crop, by 77 lb. per ac. and there was evidence that ridging lowered yields. At Matuga, 9 tons FYM per ac. applied in 1954 were more beneficial to maize, cotton and green gram yields than fertilizer applications equivalent to 3 tons of FYM, or 3 tons of FYM applied annually.
8. Report of the Agricultural Officer (Experiments) Rift Valley Province, pp. 218–33. The *Dolichos lablab* variety Brown S.A.O. was top-yielder with 753 lb. per ac., followed by Black S.A.O. and White Tambush which yielded 485 and 484 lb. per ac., respectively. In a ley establishment trial, wheat yields were not decreased by under-sowing with a ley mixture ; the pure leys sown in 1953 and 1954 yielded more than any of the other treatments. There was a significant decrease in the number of barley plants infected with bulb fly with increasing rates of 12–20 oz. wettable Aldrin powder per 100 lb. of seed. From spacing and fertilizer trials with sunflower, the optimal spacings for Giant White are 30 × 18 in. and for Mars 18 × 12 in. Phosphate alone at 150 lb. superphosphate per ac. increased yields. There were smaller responses to N.
9. Report of the Agricultural Officer (Experiments), Central Province, pp. 234–7. At Embu there were significant increases in maize yields from ridging and manuring.
10. Report of the Agricultural Officer (Experiments) Nyanza Province, pp. 238–53. At Homa Bay, 3 ft. and 5 ft. tie-ridging significantly increased groundnut and seed-cotton yields over flat cultivation. Trials at Kisii and Kakamega have shown that there is no yield advantage from tie-ridging and labour requirements are much higher than for flat cultivation. Top-yielding potato varieties at Kisii were A.49, Dutch Robjyn and Local Nyangusu. In trials on the Kano Plains since 1949, the rice varieties consistently giving the highest yields in seasons of adequate irrigation water were : Rathkayaral 3753, Ambarikore and Sindano. They are all white-grained varieties of good milling quality.—M.P.

1029 **Uganda** Department of Agriculture. Annual Report for the year ended 31st December 1954. Entebbe, 1955, pp. 138, illus.
1. Serere Experiment Station, pp. 85–101. There was a significant correlation between the yield of *Eleusine coracana* and the rainfall in May. Soil fertility in a 5-year rotation was maintained, or increased, by resting the land for 2 years under natural regeneration, or by 3 years under a *Chloris* ley, or by the application of 5 tons of manure per ac. every fifth year. Better crops were raised on plots containing old ant heaps. In a 3-year rotation, all crops responded to applications of manure; millets and groundnuts, but not cotton, responded to dressings of lime.
2. Chemistry Section, pp. 107–13. In long- and short-term fertilizer experiments the direct and residual effects of the fertilizers used were noted for maize, cotton, sorghum, pulses and *Eleusine*. In most cases mulch was found to be essential.—M.P.

1030 **Tanganyika** Department of Agriculture. Annual Report for 1954, Part 2. Dar es Salaam, 1955, pp. 129.
INVESTIGATIONS REPORTED :
1. Ukiriguru Agricultural Station, pp. 1–21. Cotton experiments. [See Abs. 191.]
2. Ilonga Agricultural Station, pp. 22–30. Cotton trials. [See Abs. 192.]
3. Colonial Agricultural Insecticide Research Unit, Ilonga, pp. 31–6. In trials on bollworm control, no insecticide showed any improvement on the standard application of 10% DDT + 3% BHC dust mixture at 10 lb. per ac., nor was there any advantage in extending the period of weekly application beyond June and July. For hand application, the Swaine Duster is recommended because of its simplicity and economy. The importance of early sowing of cotton, good growth and improved cultural methods was stressed. A preliminary experiment indicated that heavy damage to fruiting points of early, well-grown cotton did not lower yields, but the harvesting season was greatly extended.
4. Sisal Research Station, Mlingano, Ngomeni, pp. 46–58. Interplanting with sorghum again depressed yields of sisal fibre.
5. Report of the Botanist, Ukiriguru, pp. 82–7. The 1953 sorghum selection BCWK3, renamed SUK. 1, combines early maturity with a Wiru-type grain which is weevil resistant, but it is susceptible to grain smut and liable to severe bird-damage. Its yield varied in different localities but, on average, it was the top-yielder in trials. It stood up well in storage tests and showed low percentages of loss and damage. This variety is

considered to be very palatable by the local people.
6. Soil Conservation Service, pp. 93–4. The results of previous years were confirmed. Second-year maize crops were better than those of the first year after a Rhodes grass ley and after virgin grassland. Sulphate of ammonia applications and 3 rather than 2 cultivations significantly increased maize yields, particularly in the second year. Maize stover used as mulch, or dug in, severely reduced growth and yields of maize. Much the largest yields were obtained from maize growing in plots over which papyrus matting, creosoted on the underside, was laid on the surface with holes in it for the maize to grow through. In spacing trials similar yields were obtained from maize sown in double rows wide apart, and in single rows with the same total plant population.
7. Report of the Agricultural Officer (Experiments), Southern Highlands Province, pp. 95–104. Wheat. At Mbosi, 44/W/34, 291J111 and 294B2A3 outyielded other varieties, even in seasons of low rainfall. At Uyole, 44/W/34 was top-yielder with 25·5 cwt. per ac. For the Njiapanda area 341F2D1 and 341F2D2 are recommended. Maize. At Mbosi, sulphate of ammonia, superphosphate and manure all increased yields of Kenya White. Rhodesian Hybrids yielded no better than the locally grown variety, Kenya White. At Iringa, sowing trials have shown that Eckstein should be sown early in the rainy season, with at least 2 seeds per hole. Sorghum. Best spacings were 24 × 6 in. and 36 × 3 in., with an optimum plant density probably between 40,000 and 50,000 plants per ac. Sowing is best carried out in the second or third week of January. Legumes. *Crotalaria juncea*, (sunnhemp) and *C. spectabilis* produced good growth. The only satisfactory lupin variety of the 4 planted was Bitter White. *Desmodium distortum*, after a poor start, made good growth and competed well with weeds. The most promising velvet bean varieties were J.52 and Somerset. Cassava. Promising varieties were Ankrah, Msitu, 3744/E and Binti-Minsi. The groundnut variety Valencia was better than Mgogo.
8. Coast Agricultural Station, Chambezi, pp. 116–19. *Hibiscus cannabinus* var. Laos was outstanding, with varieties from Cuba and Brazil and *H. sabdariffa* (Jaffa jute) also promising.
9. Government Food Farm, Lupiro, p. 120. The rice variety Kahogo yielded better than U.V.S. ex Swaziland.
10. Report of Mahiwa Experimental Station, pp. 121–2. Highest yields of cassava were obtained from harvesting at 15 months, followed by 18 months. The varieties Local and 405/1 were the best.
11. Report of Mwanhala Agricultural Station, pp. 123–4. Mixtures of 2 or 3 crops were of greater value than the pure stand of any one crop, maize and groundnuts interplanted giving the best monetary return. January sowings are superior for maize, while December sowings are best for sorghum.
12. Tanga Province, pp. 127–9. Contour ridging gave much higher yields than flat cultivation. The Ukiriguru bred strains of cotton were superior to all local strains.—M.P.

1031 **Federation of Rhodesia and Nyasaland.** Federal Ministry of Agriculture. Annual Report of the Secretary to the Federal Ministry of Agriculture, which includes the Department of Research and Specialist Services, Conservation and Extension Services and Veterinary Services, for the year ended 30th September 1954. Zomba, 1955, pp. 115.

INVESTIGATIONS REPORTED :
1. Salisbury Experiment Station. Results of field crop trials, pp. 22–4. [See Abs. 299.]
2. Gwebi College of Agriculture. Crop husbandry experiments pp. 29–30. [See Abs. 412.]
3. Henderson Research Station. Field husbandry trials, p. 35. The Hibiscus varieties, Hibiscus ex S.A., Rosella, Cuban and Egyptian yielded 2257, 2015, 1988 and 1556 lb. fibre per ac., respectively. In hybrid-maize trials, double hybrids outyielded Salisbury White and Hickory King, 51 DH 40 giving the best yield.
4. Erosion control research, Henderson Research Station, pp. 35–6 and 74–5. In the first year of the experiments, run-off and soil-loss from a loamy soil was least under Napier fodder, considerably more under maize and most under sunnhemp either as a green crop or legume hay, on all degrees of slope tested. Increase in erosion was proportional to the square of the length of the slope ; on a 4·5% slope 7 tons of soil were lost from an acre on a 90 ft. slope and 24 tons from a 180 ft. slope.
5. Grasslands Research Station, Marandellas, p. 39. In maize fertilizer trials, yields rose with increasing applications (up to 600 lb. per ac.) of sulphate of ammonia. Superphosphate banded near maize at sowing increased yields more than when broadcast, this response was also dependent on plant population. Consistent benefit from increasing dressings of superphosphate was obtained with populations of 11,616–17,424 plants per ac. In a maize variety trial the hybrid 52 DH 6 was top-yielder with 19·1 bags per ac. [1 bag 200 lb.] and South Cross lowest with 9·9 bags per ac.
6. Rhodes Matopos Estate. Crop trials, pp. 46–7. The dwarf sorghum variety, 5140, was superior to established varieties in grain yield on both clay and sandveld. The ensilage sorghum variety Ribbon Cane 5151 outyielded maize, millet and Napier fodder on both soils. Results confirmed that compost or kraal manure should be applied direct to a maize crop. Maximum dressings of fertilizers giving significant increases in millet

yields were 300 lb. sulphate of ammonia, 100 lb. superphosphate and 50 lb. muriate of potash per ac. Very close spacing, 9 × 6 in., gave the higher yields ; November sowing, at all spacings, more than doubled the ensilage yields compared with December and January sowings. The supplementation of rainfall deficiencies by the equivalent of 6·2 in. of water in 8 applications, as flood irrigation, increased maize and sorghum yields for grain and ensilage by 50–100%. Of 25 imported potato varieties on trial, Great Scot was significantly better than Up-to-Date.

7. Sabi Valley Experiment Station, pp. 52–5. In rate-of-seeding trials with wheat, the resultant yield differences were not significant. Early sowing was superior to late sowing. A recent, field selection, Sabi X–1, was amongst the best yielders; 26 A 14 from Australia was also promising. Pusa 4 and Kenya Governor remain the 2 best general varieties at the Station.—M.P.

1032 **Southern Rhodesia.** Agricultural Experiment Station, Salisbury. Annual Report of Experiments, Season 1954–1955. By A. G. H. Rattray. *Rhod. agric. J.* 1956, **53,** No. 1, 86–101.

INVESTIGATIONS REPORTED :

1. Crop-rotation trials, pp. 87–9. The beneficial effects of a green-manure crop, or a dressing of kraal compost on the yields of a subsequent maize crop were confirmed. N was shown to be the factor limiting crop yields in 1954–5.

2. Maize variety trials, pp. 89–92. The Salisbury hybrids showed poor resistance to maize blight, *Helminthosporium turcicum*. As in the previous season, top-yielding varieties were 51H37, 50H35 and 51H39, and all experimental crosses again outyielded the commercial varieties in most localities.

3. Effects of nitrogen on the protein content of the grain of varieties of maize, pp. 92–3. The results of previous years were confirmed. [See Abs. 72.]

4. Effect of removal of parts of the plant on the yield of grain, pp. 93–5. All treatments reduced the yields of grain. Silage quality was inferior to that from whole plants. Grain yields from plants which had been cut and stooked before they were fully mature were not significantly different from the control, nor was stover quality any different.

5. Soyabeans, pp. 95–6. At a spacing of 30 × 3 in. the variety Hernon 147 again gave the highest seed yield with 10·76 bags per ac. [1 bag = 200 lb.]

6. Velvet beans, pp. 96–7. Variety No. 5 was top-yielder in the seed trial with 14·5 bags per ac. ; No 16 yielded 2·04 tons of hay per ac. Varieties 52 and 77 appear suitable for hay or green manuring where early sowing can be carried out.

7. Groundnuts, p. 98. Top-yielding varieties were Virginia Bunch, Valencia and Indian Coromandel with 35·4, 34·3 and 32·3 bags of unshelled nuts per ac. [1 bag = 65 lb.] Planting the first 2 varieties a fortnight earlier resulted in yields of 43·2 and 41·5 bags per ac., respectively.

8. Potatoes, pp. 99–100. Kennebec, Furore and Gineke yielded 117·3, 113·5 and 107·6 bags per ac. respectively. [1 bag = 150 lb.]

9. Stubble mulching and trash farming, pp. 100–1. Results after 1 season's trial show that stubble mulching reduced maize yields, whereas removal of the stalks and applying 2 tons of compost per ac., or ploughing the stalks under, increased maize yields.—M.P.

1033 **Bechuanaland Protectorate** Department of Agriculture. Annual Report, 1954. Mahalapye, 1955, pp. 23 + append. [Received Jan., 1956]

INVESTIGATIONS REPORTED :

1. Fertilizer and manurial trials, p. 4. At Lobatsi, 30% increases in maize yields resulted from an application of 100 lb. superphosphate per ac. ; up to 300 lb. superphosphate per ac., produced significant yield increases. Top yields, of 10 bags per ac. [1 bag = 200 lb.] were recorded from maize plots receiving a combined dressing of 100 lb. superphosphate and 2 tons kraal manure per ac. There was evidence that heavy applications of kraal manure accentuated the effect of a drought on the crop.

2. Agronomic investigations, pp. 5–6. A weed-control experiment showed that maize yield increases of 400 lb. per ac. can be expected following clean cultivation practices, through improved moisture conditions. There was no difference between winter- and early-spring ploughing on maize yields.

3. Variety trials, p. 6 and Appendix 1. Maize. At Lobatsi, Rhodesian Hybrid, Early Pearl and Top Cross Potchefstroom Pearl outyielded the Department-bred variety Kalahari. At Mahalapye, Top Cross Potchefstroom Pearl and Kalahari yielded best of 7 varieties. Sorghum. Of 26 varieties, Hegari and Early Hegari were top-yielders, but were not acceptable as food to the majority of the population. Groundnuts. The top yield, 924 lb. per ac., was given by Gudiyathum Bunch, followed by 43.G.348 and Improved Spanish, which yielded 811 and 809 lb. per ac., respectively.—M.P.

1034 **Belgian Congo.** Institut National pour l'Étude Agronomique du Congo Belge. Rapport annuel pour l'exercice 1954. [Annual report for 1954.] Bruxelles, 1955, pp. 492, bibl.

INVESTIGATIONS REPORTED :

1. Rice. At Yangambi, the following varieties of irrigated rice were found satisfactory for non-

irrigated cultivation : Blue Rose 41, Blue Bonnet and Zenith from North America, Perola and Iguape from Brazil, Stirpe 77 from Italy, Makalioka from Madagascar, and Mangala, Kapela, Abumonbary Vango and Bokapo from the Congo, p. 76. A study of the rooting of rice carried out with the variety R 55 on 3 soil types, sandy, clayey and sandy-clayey, indicated that at the end of the vegetative cycle the ratio between the dry matter of the aerial part and that of the root was 3·7, 8·7 and 4·8 in the 3 soil types, respectively. In sandy soil, the roots are thick and long, they have a small development in the top layer of the soil and extend in depth, 50% of the roots reaching a depth of 45 cm. at the 60th day ; hairy roots are scarce. In clay soil, the roots, which are thin, develop in the superficial layers of the soil, and there is a great development of hairy roots, pp. 76–7. In a varietal trial, R 69, already grown on native farms, was best, p. 84. In a study on mineral nutrition, the ionic equilibrium favourable for growth, development and yield was investigated, pp. 171-2.

2. Maize. In a study on mineral nutrition, the optimum anion/cation ratio was investigated, pp. 168–9 and 173–5. First results from varietal trials indicated that in forest soil the variety Kahila, and in savannah soil (Kasai and Katanga) the hybrid No. 2, yielded more than the local maize, p. 322. Close spacing, 100 × 30 cm., was found to be best in years of high rainfall, p. 347.

3. Groundnuts. In a varietal trial, AE 59 was best, yielding 989 kg. of nuts per ha., p. 200. Flowering in 1954 started 25 days after sowing (24 days, on an average, in the 3 previous years) ; the period of maximum intensity of flowering (more than 3 flowers per plant and per day) was from 31 to 48 days after sowing in 1951, 30–47 days in 1952, 31–57 in 1953 and 32–52 days in 1954, p. 281. The variety A 65 was multiplied for cultivation on native farms, p. 324. For control of *Cercospora personata*, groundnut plots were treated with copper oxide solution at 0·35%, or with Bordeaux mixture suspension at 1%, each applied at the rate of 800 l. per ha. ; 2 treatments were given at a 15-day interval. Treatment increased yields by 40–60% over the untreated control, which yielded, on an average, 1167 kg. of dry unshelled nuts per ha., copper oxide being more effective than Bordeaux mixture, pp. 331–2. In Kwango, in plateau soil, sowing at a depth of 2–4 cm. was generally best, pp. 339–40. In varietal trials at Lubarika Station, A 1055 of the Java type, which has small pods and pink seeds, yielded best in both dry and irrigated cultivation, p. 347. In a trial at Lubarika in which spacings at 20 × 20 cm., 40 × 10 cm. and 80 × 0·5 cm. were tested, yields were 825, 833 and 633 of dry, unshelled nuts per ha., respectively ; sowing 1 seed, 2 seeds or 1 pod per hill yielded 565, 690 and 375 kg. of dry, unshelled nuts per ha., respectively, p. 347.

4. *Urena lobata*. A good bast fibre is obtained by retting fresh stems at 30°–35°C. for 5 days ; the length of storage has an unfavourable effect on fibre quality, p. 216.

5. Cotton. In a series of trials at Bambesa Station, the variety Bambesa 197 was superior to the control Stoneville 5, pp. 276–9. In both forest and savannah soils, spacing at 60 × 25 cm. was best, p. 288. In trials at Boketa Station in which spacings at 80 × 30 cm., 60 × 30 cm. and 60 × 20 cm. were tested in both forest and savannah soils, spacing at 60 × 30 cm. gave the highest yields, p. 309. In trials at Gandajika Station, the variety C 2 was more resistant to *Lygus* attack and boll rot than the variety Gar and also was better than Gar in length and strength of its fibre ; it is intended to introduce C 2 in Kamana, p. 318. In varietal trials in Kivu and Urundi, the variety Gar 105 yielded best, p. 345. In Maniema, close spacing at 60 × 30 cm., and thinning to 2 plants, were best, p. 355.

6. Millet (*Pennisetum typhoideum*). In a trial in plateau soil, the selected variety Masangu and the non-selected variety yielded 585 and 546 kg. per ha., respectively, p. 334.

7. Cassava. In varietal trials, Masodi Sali was best both in valley and plateau soils, where it yielded 50 and 17 metric tons of fresh roots per ha., respectively. p. 336. The variety Criolinha 750 was multiplied for cultivation on native farms, p. 447. In a varietal trial at Rubona Station, the variety Eala bitter 07 was best, yielding 43,200 kg. per ha., followed by Criolinha 750 with 35,500 kg. per ha., p. 458.

8. Sweet-potato. Results from 3 trials indicated that the variety C.S.K. 21 was best for tuber production, and that the varieties C.S.K. 17, C.S.K. 9, Kayamba, C.S.K. 8 and Kansansa were best both for fodder and tuber production, p. 366. In a varietal trial, Locale was best, yielding 26,084 kg. of fresh tubers per ha., p. 402. At Pimbo, Djugu, the 2 best varieties, Ndele and Takanaka, yielded 21,100 and 15,340 kg. of fresh tubers per ha., respectively, p. 426. In varietal trials at Rubona Station, the variety Caroline Lea was best, yielding 16,053 kg. after 250 days, p. 457. The variety Norton Sam is widely grown at high altitudes (1900 m. a.s.l.), where it yields 7000–9000 kg. per ha., and also on lower regions, p. 468.

9. Potato. In a varietal trial, Furore and Aquila were best, yielding 29,300 and 29,100 kg. per ha., respectively, p. 368. In a trial in which 13 varieties, grown at a spacing of 70 × 50 cm., were harvested at the beginning of March, Up-to-Date, Ackersegen and Industrie (Hollande) were best, yielding 389, 372 and 366 g. of tubers per plant, respectively, p. 382. In a trial to control *Alternaria solani* on the varieties Bevelander and Up-to-Date, treatment with a 0·5% solution of a preparation containing 65% of Zineb increased the yields of the 2 varieties by 46 and 72%, respectively, over the untreated control, pp. 389–90. The varieties

Sientje and Blauwe Eigenheimer yielded 66 and 50% more, respectively, than the control Industrie (9430 kg. per ha.), p. 457.
10. *Crotalaria usaramoensis* gave good results when grown for green manure, p. 383.
11. Beans (*Phaseolus* spp.). The varieties Ibundu and Beurré d'Alger yielded best, p. 404. In varietal trials, the best varieties of *Ph. vulgaris*, H 7, H 33 and Colorado, yielded 1360, 1275 and 1270 kg. of dry seed per ha., respectively, p. 445. The best varieties of *Ph. angularis*, PA 011, PA 014 and PA 010, yielded 1755, 1655 and 1408 kg. of dry seed per ha., respectively, p. 446. The variety Colorado (0688) is under multiplication at Kisozi Station, p. 468.
12. Wheat. The varieties JC 73 and Kisozi (145)–7 were multiplied at Lubero, Kivu ; the former increased general yields by 20–25% and the latter showed improved baking quality. The variety (130)–1–77 was introduced into various regions of the Ruanda-Urundi, where it yielded 1000–1200 kg. per ha. The variety Kiska was introduced into the Urundi, p. 467.
13. Weeds. *Mimosa invisa* was controlled by one application of a preparation containing 80% amyl ester of 2,4,5-T, at the dose of 0·25%. This preparation was also effective against *Ipomoea involucrata* and young plants of *Cassia floribunda*, p. 90. A study of weeds of annual crops indicated that : (a) the application of fertilizers encouraged the growth of *Eleusine indica*, *Digitaria horizontalis*, *Talinum triangulare* and *Oldenlandia corymbosa* and discouraged the growth of *Eragrostis squamata* ; (b) liming encouraged the growth of *Portulaca oleracea* ; (c) the cultivation of a legume in the rotation encouraged the growth of *Eleusine indica*, pp. 90–1. *Commelina nudiflora* was controlled by treatment with the sodium salt of 2,4-D applied at the rate of 1·5 kg. of acid equivalent in 250 l. of water, per ha., p. 97.—E.B.O.

1035 **Australia.** Queensland Department of Agriculture and Stock. Annual Report for the year 1954–55. Brisbane, 1955, pp. 99, illus.

INVESTIGATIONS REPORTED :

1. Crop trials, pp. 31–8. Maize. The superiority of Queensland and Grafton hybrids in yield and adaptability was seen in all areas, except the Atherton Tableland where the local varieties were best. At Kairi there was no evidence that maize-stubble mulching lowered maize yields, but disease incidence was greater on plots where maize residues had been left, than where the residues had been raked and burned. The cowpea varieties Cristaudo and Giant showed a high degree of field resistance to stem rot. Soutter was promising. Potatoes. The variety Sebago planted at a plant-spacing 4–6 in. and at 15 in. for seed, produced 74% and 79%, respectively, of tubers over 3 oz.
2. Soil conservation, p. 37. African star grass [*Cynodon plectostachyus*] was the most rapid colonizer of gullies in the Central Highlands. On the Darling Downs, Kikuyu grass [*Pennisetum clandestinum*] planted as runners in strips 18–24 in. apart gave 40%, 70% and 100% cover at the end of 2, 4 and 6 months. The total cover was estimated to be capable of carrying a sustained water flow of up to 8 ft. per sec.
3. Crop trials, Hermitage, pp. 39–40. Wheat. The best early variety was Spica, followed by Seafoam and Gabo. Of the later varieties, Lawrence, Festival and Charter were the 3 best yielders. Wheat quality studies with the variety Puora indicate that soils of high fertility produce grain of high protein content. Grain sorghum. In the dry summer, a light stand of Kalo yielded 36 bu. per ac., whereas the uniformly heavy stands of the varietal trails failed. Giant Russian sunflower outyielded Jupiter this year, but was difficult to harvest owing to its height and unevenness.
4. Crop trials, Biloela, pp. 40–1. Oats. Results indicate the superiority of Garry and Vicland as dual-purpose hay and grain varieties when sown in the late autumn. Wheat. With seeding rates of 30–90 lb. per ac., the highest rates yielded most grain, contrary to the previous year's results. Soyabeans. Clemson and Rose Selection No. 2 outyielded Nanda. Rate-of-seeding trials indicated that plant population per row-foot was more important than the variations between the 27, 34 and 42 in. row-spacings.
5. Crop trials, Ayr, pp. 41–2. Maize. In the Burdekin Delta, 1–2 cwt. of sulphate of ammonia per ac. applied when plants were 12–15 in. high, with an additional 1 cwt. at the pre-flowering stage, enhanced yields. Sowing immediately after the wet season was more profitable and required less irrigation water. Sunflowers. Spacing the plants 8 in. apart in 42 in.-spaced rows produced taller plants with smaller heads than those spaced at 15 in. in the row. Yields fell when plants were more than 15 in. apart, or when the rows were left unthinned. The early wheat variety, Spica, yielded most with 38·4 bu. per ac.
6. Crop trials, Kairi, pp. 42–3. Maize. Weed control with pre- and post-emergence sprays of 2,4-D was no better than inter-row cultivation with slight hilling-up of the rows. Maize plants spaced 12 in. apart in rows spaced at 42 in. apart. gave greater yields than those at 16 in. apart and responded more to 100 lb. sulphate of ammonia per ac. applied when the plants were 15 in. high and again when 30 in. high. Atherton Tableland Durum varieties outyielded the Dent varieties. Of the legumes on trial, mung bean (*Phaseolus mungo*) most effectively suppressed weeds. The cowpeas Cristaudo, Q3147 and Q3134 were valuable as green manures.
7. Brigalow, (*Acacia harpophylla*) control, p. 49. Oil-based chemicals were superior to emulsions as defoliants, especially at low rates. Aerial application of 1 lb. of 2,4,5-T in oil was effective in killing 8-week-old suckers.—M.P.

BOOKS

1036 HOLLY, M. A. **Agriculture in Haiti.** 1955, pp. 313, bibl. 51, illus., New York ; Vantage Press, Inc., 22 × 14 cm., $3·50 or 26s. 6d.

1037 BUCHANAN, K. M. and PUGH, J. C. **Land and people in Nigeria.** 1955, pp. xii + 252, bibl. in text, illus., London ; Univ. Press Ltd., 25 × 18 cm., 35s.

1038 ESCH, J. A. H. and others. **Dutch potato atlas.** 1955, illus., Wageningen, Netherlands; Veenman and Zonen, 22 × 16 cm., £3 9s., $9·50, D.M.40.50, Fr. fr. 3400, Fr. belge 490. [Received March, 1956]

A wide range of potato varieties is cultivated in the Netherlands in order to satisfy the many types of environment in which they are cultivated there, the variety of purposes for which the crop is grown, and the diverse requirements of the countries to which the potatoes are exported. In this so-called atlas, 46 potato varieties of Dutch and foreign origin, all cultivated in the Netherlands, are described and illustrated. It is emphasized that the descriptions are based on observations and results obtained from cultivation under the conditions of soil and climate in the Netherlands and that the qualities of the tubers are assessed according to Dutch standards. For example, a good cooking quality means good according to Dutch standards ; that is, a dry, mealy, rather firm potato with a good flavour, not one which retains its shape on cooking.

A page of text and a facing page of coloured illustrations is devoted to each of the 46 varieties, arranged alphabetically. For each, the following preliminary information is given : name, earliness (or lateness), purpose for which used, the breeder, genetic origin, date of introduction, and countries in which it is cultivated. The short accounts of each variety which follow are taken from the official Netherlands publication " Descriptive list of varieties of field crops " and are given under the following heads : development and general appearance, stems, leaves, inflorescence and flower, sprouts, tubers, resistance to disease, agricultural value, utilization and cooking quality.

Like Fischnich and Höppner's " Key for the determination of potato varieties by means of the light sprouts and the tubers " [*Fld Crop Abstr.* 8 : 1155] this Dutch publication is produced as a loose-leaf book. The section on varieties is unpaged to allow for the insertion of additional sheets, dealing with other varieties, which will be printed annually. The text and illustrations are beautifully printed on paper of good quality, and are clipped in a green, pliable plastic cover which is a pleasure to handle. Special mention should be made of the illustrations, which, apart from the green of the leaves, are excellently reproduced. The shading and the matt surface of the paper give an almost solid appearance to the tubers and a spatial effect to the flowers.

The book can be obtained with text in Dutch, English, French or German and will be published in other languages, " if sufficient interest develops". The authors hope that " the atlas will prove to be valuable to the breeder, the grower, the dealer and to all concerned with potato varieties". It surely will.—D. BROWN.

1039 AMARAL, J. D. A conservação da batata. [**Potato storage.**] 1955, pp. xv + 396, bibl., illus., Lisbon ; Livraria Sá Da Costa, 20 × 14 cm. [Received Dec., 1955]

The principal aspects reviewed in this book are : chemical composition and nutritive value of potatoes ; physiology of the potato tuber after lifting ; different methods of storing potatoes ; construction, requirements and maintenance of potato stores ; sprout inhibitors ; damage caused by diseases and pests ; economics of potato storage. There are many illustrations, tables and graphs, and many references to world literature at the end of each chapter.—E.B.O.

1040 SHELL CHEMICAL COMPANY, LTD. **Farm weeds. An aid to their recognition.** 2nd edn [n.d.] pp. 80, illus., London ; Shell Chem. Co., Ltd., 21 × 14 cm., 5s.

This publication is intended mainly for the use of farmers. It contains coloured plates of the seedlings, young plants and flowering heads of 60 species, including both arable and grassland weeds, together with brief notes on their characteristics. This is a mine of information for those interested in the exhaustive and not infrequently diverting list of common and local names of weed species in Great Britain.—P.J.B.

1041† MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, ENGLAND AND WALES. **Weather and the land.** *Bull. 165. Minist. Agric. Fish. England and Wales* 1955, pp. 35, illus., maps, London ; H.M. Stationery Office, 24 × 15 cm., 3s.

This bulletin, written by the Agricultural Branch of the Meteorological Office, describes the factors governing the British climate, gives the reasons for local variations, and shows how to interpret weather signs in the sky and wind. A knowledge of these weather signs is invaluable to the agriculturist and this publication should help him to apply the official forecast more precisely to his

own locality and so save him time and money by wise planning and adjustment of work.

The bulletin includes details of the various meteorological services available and the telephone numbers of the Forecast Offices.

1042 MORGAN, L. **A plough on the mountain.** 1955, pp. 191, London ; Odhams Press, Ltd., 22 × 14 cm., 12s. 6d.

1043† ADDISON, H. **Land, water and food.** 1955, pp. xii + 248, bibl. 59, illus., London ; Chapman and Hall, Ltd., 23 × 14 cm., 18s.

This book on world food supplies differs in various ways from others that have appeared during the past few years. First of all, it begins at the beginning of the problem, namely, water. Without water, neither food-plants nor animals nor man himself would survive, and so the first chapter is entitled " Where is the water ?" Then, instead of upbraiding mankind for what mankind has failed to do—or is alleged to have omitted to do—the book tries to do justice to what men have in fact succeeded in doing. That is its central theme. Successive chapters describe in general terms some of those magnificent land reclamation projects, both in the new world and the old, which in recent years have so signally augmented agricultural production.

1044† UNITED STATES DEPARTMENT OF AGRICULTURE. **Water. The Yearbook of Agriculture,** 1955, pp. 751, illus., Washington ; United States Govt Print. Office, 23 × 15 cm., $2.

This publication, like its predecessors, is addressed primarily to farmers. Its scope is wide and covers almost all aspects of water in agriculture, including meteorology, water in relation to soil, watershed conservation, irrigation, water and crops, pastures and rangelands and land drainage.—P.J.B.

1045 BARNES, H. F. **Gall midges of economic importance. Volume 7. Cereal crops.** 1956, pp. 261, illus., London ; Crosby Lockwood and Son, Ltd., 22 × 14 cm., 21s.

NEWS ITEMS AND NOTES

Great Britain

1046† The Commonwealth Phytopathological News, which began publication in January, 1955, is a quarterly review of news and views on developments in plant pathology throughout the British Commonwealth. Contributions from mycologists and plant pathologists in the Commonwealth, in the form of observations, queries and short notes of interest to others will be welcomed. It is issued by the Commonwealth Mycological Institute, Kew, Surrey, England ; price 5s. p.a.—M.P.

1047 Woodstock Agricultural Research Centre, recently enlarged, was officially opened by Sir William Slater, Secretary of the Agricultural Research Council, on 15 May, 1956. This Centre, which covers about 250 acres near Sittingbourne, Kent, is now the Headquarters of all agricultural research carried out in Europe by the Royal Dutch/Shell Group. Before 1954, responsibility for this research was divided between Woodstock and the Group laboratories in Amsterdam. As a result of the amalgamation, many of the Dutch research staff have been transferred to Woodstock. The Centre works in close contact with its sister laboratories in Dember and Modesto, USA.

Belgium

1048† Seed Exchange. A list of seed offered in exchange by the Jardin Botanique de l'État, Bruxelles, is contained in the supplement to Vol. 25 of *Bull. Jard. bot. Brux.* December, 1955. The list includes numerous items under Gramineae and Leguminosae.—D.B.

Germany

1049 Professor E. A. Mitscherlich died on 3 February, 1956, in his 82nd year, at Paulinenaue near Berlin. Prof. Mitscherlich's researches centred round yield-determining factors, and he investigated the quantitative relationship between the many external growth factors operating in soil and climate and the internal growth factors operating within the plant. He was the originator of the plant-physiological evaluation of soil and climate. *Z. Acker- u. Pflbau* February, 1956.—D.B.

1050 Zeitschrift für Acker- und Pflanzenbau (up to 10 years ago known as *Journal für Landwirtschaft*) is celebrating the publication of its 100th volume. No. 1 of this volume gives a history of the journal. No. 4 contains an author index for Vols. 1–100 (1853–1956) and a complete list of original papers, classified according to subject, which this journal has published ; the complete reference is given to each paper.—D.B.

Switzerland

1051† Potassium Symposium. The annual meeting of the Board of Technical Advisers of the International Potash Institute was held in Zurich in 1954. Among the papers read were the following : The K metabolism of plants (X. Berger) ; The absorption of K by the plant (A. C. Schuffelen) ; K deficiency in cultivated plants in the French part of Switzerland (E. Bovay) ; The determination of K requirements by visual symptoms and plant analysis (T. Walsh). *Potassium Symp.* 1954. [Received Feb., 1956.]—E.B.O.

Italy

1052 Wheat. Total production in 1955 was 9500 million kg., the highest on record, from an area which was about the same as in previous years. The average yield was 2000 kg. per ha., but over whole provinces average yields of 3000–3500 kg. per ha. were recorded. [See also *Fld Crop Abstr.* 7 : 353.] *G. Agric. Domen.* 1 January, 1956.—E.B.O.

1053† Hail Prevention. Of the 300,000 ha. which are under cultivation in Piemonte, 250,000 ha. will be protected from hail by the use of radio-active oxides, in addition to rockets. The radio-active oxides, which will be sent up in small balloons as a preventive measure at the beginning of storms, will cause the water vapour to fall as rain instead of hail. Rockets will be fired only when the oxides have been partially successful. It is thought that the use of radio-active oxides will lower the present cost of the anti-hail defence. [See also Abs. 584.] *G. Agric. Domen.* 25 March, 1956.—E.B.O.

Israel

1054 Arid Zone Research Institute. The construction of this Institute has been started in Beersheba. It will offer scientists in this field of research laboratory space, modern facilities and experimental plots for their work. The Institute will be open to scientists from abroad who are working on arid-zone problems. *Bull. Res. Coun. Israel* Dec., 1955.

Australia

1055 Wind Damage in Barley Crops. A farmer in South Australia claims that rolling a barley crop flat a week before it is ready to be reaped eliminates wind damage and produces a better sample. In a trial at Roseworthy Agricultural College, 12.5 % more barley was reaped from a rolled plot than from a plot in the same crop reaped in the normal way. *Aust. agric. Newslett.* March, 1956.—M.P.

USA

1056 Trials with 2,4-DB and MCPB. At a recent meeting of the Weed Society of America, W. C. Shaw, of the Agricultural Research Service, U.S. Department of Agriculture, gave a report on the results of preliminary trials with MCPB and 2,4-DB in different States of the USA. In Montana, MCPB gave excellent top kill of *Cirsium arvense* and other broad-leaved weeds in canning peas, with no damage to the legume. In Mississippi, MCPB was much less toxic to cotton than MCPA or 2,4-D. In

Arkansas, MCPB and 2,4-DB were very effective for controlling weeds in rice and resulted in less injury to the rice than standard herbicides in current use. Pre-emergence treatments with 2,4-DB and MCPB resulted in good control of a number of annual broad-leaved weeds and grasses with much less injury to maize, cotton, soyabeans, groundnuts and sorghum than similar treatments with 2,4-D and MCPA. *J. agric. fd Chem.* 1956, Vol. 4, No. 9.—P.J.B.

Enquiries received

1057 Arising from enquiries received and answered by the Bureau from December, 1955, to May, 1956, bibliographies on the following were prepared and are available on request :

The sprouting of potatoes by artificial light.
Wheat, seed rates for.
Windbreaks on farm lands.
Reclamation and re-vegetation of industrial waste land.

Commonwealth Tour

1058 The Director of the Commonwealth Bureau of Pastures and Field Crops, Mr. A. G. G. Hill, will leave for a tour of Commonwealth countries in September, 1956, visiting the following countries on the dates shown : Canada (20 September to 21 October), Fiji (24 to 30 October), New Zealand (31 October to 29 November), Australia (30 November to 11 January) and Ceylon (13 to 21 January.) The itineraries for Mr. Hill's journeys are being arranged by the Bureau's Official Correspondents in the countries visited. A list of these Correspondents, with their addresses, is given in *Herbage Abstracts*, Vol. 26, No. 1 and *Field Crop Abstracts*, Vol. 9, No. 1.

NOTICE

VICTORIA, AUSTRALIA, OFFER £1,000 FELLOWSHIP IN NATURAL HISTORY

The Fellowship worth £1,000 (Australian) is offered in Natural History by the British Memorial Fund, established in Victoria, Australia, by public subscription. The Fellowship is a gesture of ' loyalty, gratitude and affection ' to the British people in recognition of their ' role in saving civilisation in the Second World War '. It provides for ten (10) months' study in Victoria for the selected candidate and covers travelling and living expenses during the period. Accommodation will be arranged by the Fund. Wives and children are welcome but no extra expenses can be paid to cover them. The upper age limit for both men and women is 35 years, and applicants must be of British stock of at least 10 years' residence in the United Kingdom.

The Fellowship is to be granted to one of the following :

1. A graduate in Science, Agriculture, or Forestry, who is working in the field of Plant or Animal Ecology or Taxonomy.
2. Any person whose publications or testimonials indicate that he or she has made worth-while contributions in Natural History or Field Biology (e.g. Taxonomy, Life Histories, Bird Migration, Plant or Animal Distribution).
3. An officer of a Herbarium, Natural History Museum, or the British Nature Conservancy, including qualified technicians trained in the newer techniques of plant and animal preservation and display.
4. An educationalist with special qualifications in Natural History or Field Biology.

Full details can be obtained from Colonel the Hon. W. W. Leggatt, Agent-General for Victoria and Chairman of the British Memorial Fund, London Selection Committee, Victoria House, Melbourne Place, Strand, London W.C.2. Closing date for the receipt of applications—15th September, 1956. Simultaneously with the Fellowship in Natural History, a Fellowship in Chemical Engineering and two others where applicants may choose their course of study or research, are being offered by the Fund.

Members of the London Selection Committee are :

Col. the Hon. W. W. Leggatt (Chairman)
Lady Albemarle
Lord Huntingfield
Lord Baillieu
Sir Vincent Tewson
Sir Angus Gillan

Dr. J. F. Foster (Secretary), Association of Universities of the British Commonwealth